FINAL

ENVIRONMENTAL ASSESSMENT

FOR A ONE-MEGAWATT SOLAR ARRAY AT

CHEYENNE MOUNTAIN AIR FORCE STATION

April 2010

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EXECUTIVE SUMMARY AND FINDING OF NO SIGNIFICANT IMPACT

1-MEGAWATT SOLAR ARRAY AT

CHEYENNE MOUNTAIN AIR FORCE STATION

1.0 INTRODUCTION

The United States Air Force (USAF) Cheyenne Mountain Air Force Station (CMAFS) proposes to install a solar array on CMAFS in response to legislation requirements including Executive Order 13423 and the Energy Policy Act of 2005. Within the past several years, costs and demand for energy produced through non renewable resources, such as crude oil, have increased dramatically. In response to this energy crisis, Congress passed the Energy Policy Act of 2005 (PL 109-58), which was signed by President Bush on August 8, 2005. Among the many energy conservation measures, the Act directs the federal government to use more renewable energy, with a goal of using 7.5 percent or more by 2013. Solar power is among the renewable energy sources promoted in the Act.

Outside sources of electric power used by CMAFS are provided by Western Area Power Administration (WAPA) and by Demand Side Management and Renewable Energy Solutions - Colorado Springs Utilities (CSU) which also provides electrical power to the Colorado Springs metropolitan area. The CSU have a mix of self-generated hydroelectric power (34-megawatt [MW]); purchased wind power (1-MW); and customer provided photovoltaic power (189 kilowatts in 2008, and approximately 400 kilowatts in 2009). Colorado Springs Utilities have purchased renewable energy credits (RECs) and are in the process of purchasing 50 MW of electricity from wind generating sources. The CSU has been able to meet their Renewable Energy requirement in 2008 with self-generated hydroelectric power.

The construction and operation of a 1-MW solar array would provide the base with up to 4.5 percent of its required electricity, which would decrease the CMAFS reliance on WAPA and CSU electrical power. The Proposed Action would support the EPACT, increase overall Air Force use of renewable energy, and allow CMAFS to support the DOD installation energy policy long-range goal for renewable energy use.

The Proposed Action and Alternatives were assessed in an Environmental Assessment (EA) which is incorporated herein by reference.

2.0 PROPOSED ACTION

The Proposed Action is to install a 1-Megawatt (MW) Solar Array on Cheyenne Mountain Air Force Station (CMAFS), Colorado Springs, Colorado. The solar array would be designed for future expansion to a 2-plus MW system and would comply with 2008 National Electric Code (NEC) and National Fire Protection Association (NFPA)-70 criteria. A 1 MW system encompassing approximately 5,600 solar panels mounted on racks, aligned in access rows, and positioned in a southerly direction and would be located on Site 1, approximately 10.3 acres, as shown on Figure 1. The arrays would be embedded into the ground with concrete footings. A small unmanned building, no larger than 1,500 square feet would be built to house inverters and optional battery storage; no heat, water, or sewer would be required for the building. The building would include a containment system to safeguard battery leaks. Inverters would be used to transform direct current (DC) to alternating current (AC). Transformers would be installed to step up voltage so that it is compatible with the CMAFS electrical system. The stepped-up power would then

be connected to the CMAFS power distribution system. Security fencing would completely surround the solar array site.

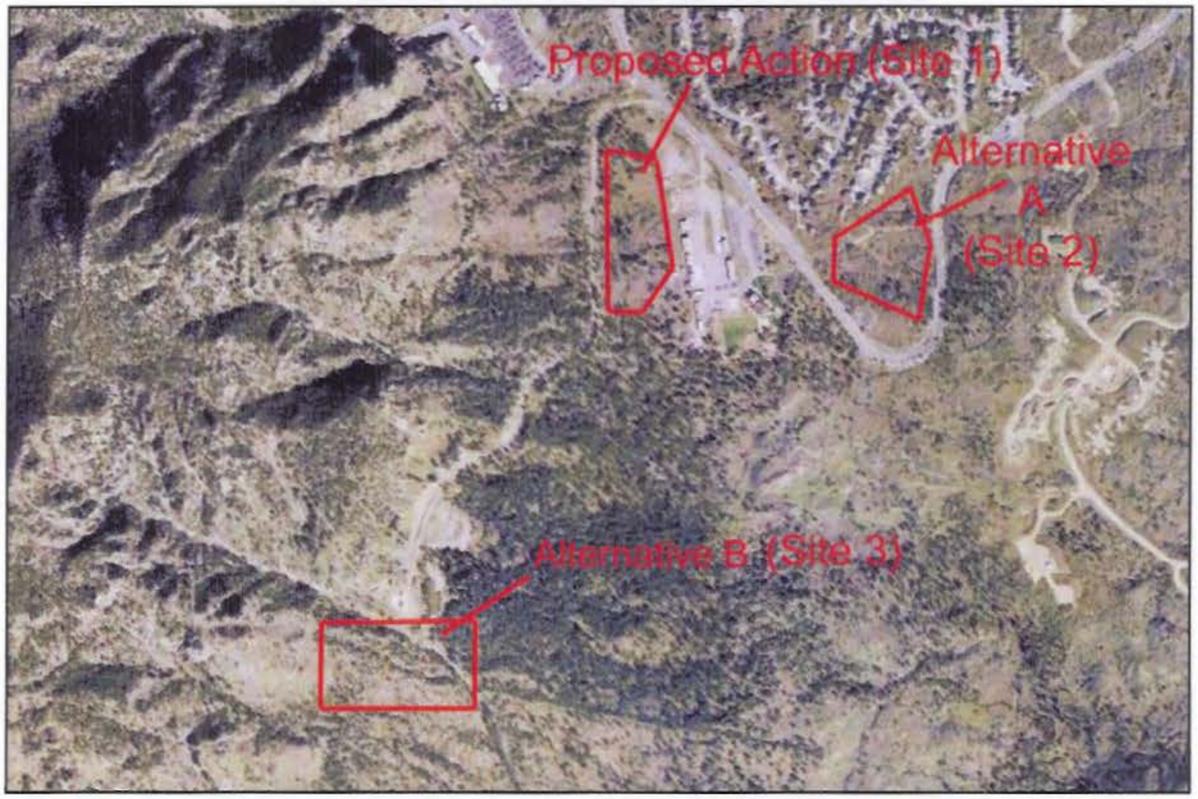

Figure 1 Proposed Action and Alternative Site Locations

The solar array would tie into the CMAFS electrical system through a 15 kilovolt ampere (kVA) switch. The switch would feed the Cheyenne Mountain Complex electrical system. This would protect the integrity of the CMAFS system during electrical failures and lightning strikes. The power from the solar array would be designed to continuously feed power to the CMAFS electrical system. All power produced from the solar array would be used by CMAFS. It is estimated that the system would meet approximately 9.5 percent of the CMAFS electrical power demands. An electric meter would be placed where the power connects to the CMAFS system to provide the CSU and WAPA new metering requirements. Concrete encased conduit connecting the solar panel arrays to the switch would be placed underground in trenches that could be as deep as 5 feet in some areas, but typically no deeper than 3 feet, and covered with earth. Following emplacement of the conduit, disturbed areas would be graded to maintain current drainage patterns. Transformers would be located at least 100 feet away from other facilities. Regular cleaning of the solar panels would be accomplished by either rinsing with water, blowing with compressed air, or a combination of both. All solid waste generated during construction would be removed by the contractor and disposed of at an appropriate disposal facility outside of CMAFS.

2.1 ALTERNATIVE A

Alternative A would be the same as the Proposed Action except for the location of the solar array. Under Alternative A the solar array would be located at Site 2. Site 2 as shown on Figure 1 would comprise approximately 10.1 acres.

2.2 ALTERNATIVE B

Alternative B would be the same as the Proposed Action except for the location of the solar array. Under Alternative B the solar array would be located at Site 3. Site 3 as shown on Figure 1 would comprise approximately 17.2 acres.

2.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative the solar array would not be constructed at CMAFS. The base would not meet the DOD and Air Force goals for use and generation of renewable energy sources.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER REVIEW

Because CMAFS is only 568 acres and is predominately rocky mountainous terrain with slopes up to 90 percent grade, there is limited space for construction of a solar array system or other facilities without creating a visual impact on the area. The Air Force considered construction and operation of a wind turbine; however, a wind turbine needed to provide over 1-MW would be extremely large. For example the widely used General Electric 1.5-MW model, consists of 116-foot long blades atop a 212-foot high tower for a total height of 328 feet. The blades sweep a vertical airspace of just under an acre. Another model being seen more in the United States is the 2-MW Gamesa G87 from Spain, which sports 143-foot long blades (just under 1.5 acres) on a 256-foot tower, totaling 399 feet. Many existing models and new ones being introduced reach well over 400 feet high. Additionally, since the average wind speed is less than 10 miles per hour, the efficiency of a wind turbine would be less than optimal because wind power is in the poor to marginal range west of Colorado Springs (United States Department of Energy and National Renewable Energy Laboratory 2004).

2.5 SUMMARY OF ANTICIPATE ENVIRONMENTAL IMPACTS

Analysis performed in the EA addressed potential effects of the Proposed Action and Alternatives on Air Quality, Biological Resources, Climate, Cultural Resources, Geology and Soils, Hazardous Materials/Hazardous Waste/Solid Waste, Land Use, Noise, Socioeconomics, Environmental Justice and the Protection of Children, Utilities/Infrastructure, Visual/Aesthetics, and Water Resources. The analysis indicated that implementing the Proposed Action, Alternative A or Alternative B would have no significant direct, indirect, or cumulative effects on the quality of the human or natural environment.

2.6 PUBLIC REVIEW AND COMMENT

The Draft EA and Draft FONSI were made available for a 30-day public review and comment from February 12, 2010 through March 15, 2010 at the Penrose Branch of the Colorado Springs Public Library. The availability of the document was advertised for review and comment in the Colorado Springs Gazette on February 10, 2010 and February 14, 2010. Copies of the three comments received along with the Air Force response to those comments are provided in Appendix E.

3.0 FINDING OF NO SIGNIFIACNT IMPACT (FONSI)

Reasonable alternatives to the Proposed Action were considered. The Proposed Action was found to be the preferable action to meet CMAFS purposes and needs. After review of the EA prepared in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and the Environmental Impact Analysis Process (32 Code of Federal Regulations 989, as amended), I have determined that the Proposed Action would not have a significant impact on the quality of the human or natural environment. Additionally, Alternative A or Alternative B sites would also result in a less than significant impact on human or natural environment and could be used for similar applications. There would be no significant cumulative impacts resulting from implementing the Proposed Action or Alternative Actions. An Environmental Impact Statement (EIS) will not be prepared. This decision has been made after taking into account all submitted information and considering a full range of practical alternatives that would meet project requirements and are within the legal authority of the Air Force.

Russell A. Wilson
Colonel, USAF
Commander

3 May 2010
Date

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) evaluates the potential environmental effects associated with the proposed construction and operation of a 1-Megawatt (MW) Solar Array at Cheyenne Mountain Air Force Station (CMAFS), Colorado. This EA is being prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321 *et seq.*); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500–1508); Title 32 CFR Part 989; and all other applicable federal and local regulations. CMAFS initiated an Air Force Form 332 and 813 to ensure applicable environmental requirements were included as part of the decision-making process (Appendix D). The NEPA requires federal agencies to consider the environmental consequences of all Proposed Actions in their decision making process. The intent of NEPA is to protect, restore, or enhance the environment through a well-informed decision making process. The CEQ was established under NEPA to implement and oversee federal policy in this process. To this end, the CEQ issued the Regulations for Implementing the Procedural Provisions of NEPA. The United States Air Force (Air Force) is representing the Department of Defense (DOD) as the lead agency.

1.2 LOCATION

CMAFS is located in El Paso County, Colorado approximately 72 miles south of Denver, Colorado and 7 miles south-south-west of Colorado Springs as shown on Figure 1-1.

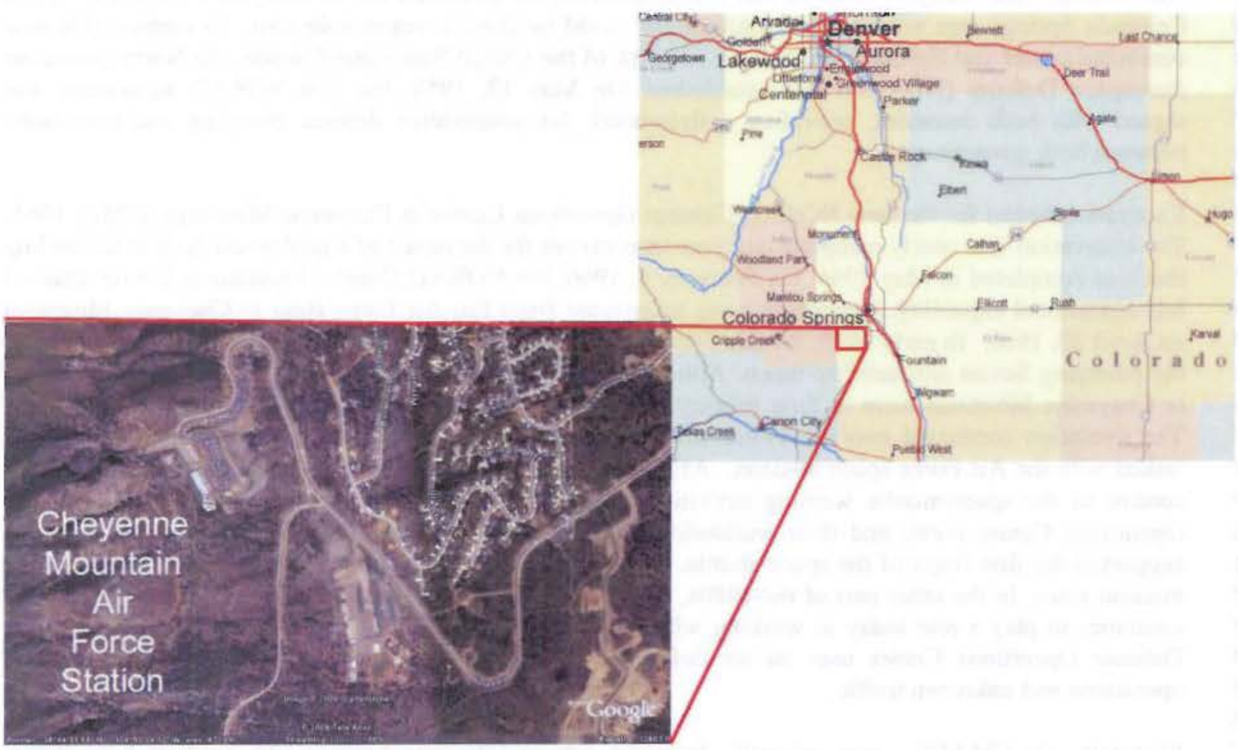

Figure 1-1 Location of Cheyenne Mountain Air Force Station

CMAFS is approximately 568 acres (230 hectares), with an approximate elevation of 7,000 feet (2,134 meters) above mean sea level (MSL). Of the 568 (230 hectares) acres that CMAFS encompasses, two acres are improved lands, 86 acres (35 hectares) are semi-improved, and 480 acres (194 hectares) are unimproved. The 88 (36 hectares) acres of improved and semi-improved land is divided into the upper support complex and the lower support complex. The upper support complex includes the North and South Portals to the underground complex, the Technical Support Facility, the Security Operations Center, a microwave antenna area, and parking for over 400 vehicles. The lower support complex includes the Roads and Grounds Compound, the Visitor's Center, the Mountain Man Park recreation area, and parking for over 150 vehicles. An overflow parking lot is east of the Roads and Grounds Compound, at a slightly lower elevation.

1.3 HISTORY

Before the US Air Force acquired the CMAFS, the land was used for a variety of purposes. The largest portion of land (266 acres [108 hectares]) was acquired from the estate of J. Robert Neal. Other uses included the JL Ranch, which was used for cattle grazing, and the Star Ranch, which was the location of a youth camp. In January 1950, the CMAFS area and large areas surrounding it were heavily burned by a major fire that covered a large portion of the east slope of Cheyenne Mountain. In January 1956, General Earle E. Partridge, Commander in Chief of what was then the Continental Air Defense Command, laid the groundwork for the DOD requirement for a new underground combat operations center. The old aboveground center at Ent Air Force Base in Colorado was too small to manage the growing air defense system and was highly vulnerable to sabotage or attack. This new combat operations center was to be remote from other prime targets and hardened to withstand a thermonuclear blast. Studies and analyses showed that a command center hollowed out of Cheyenne Mountain in the Colorado Springs area was the best solution and could be done at reasonable cost. To oversee this new command center and the entire air defense network of the United States and Canada, the North American Aerospace Defense (NORAD) was established. On May 12, 1958, the first NORAD agreement was signed with both countries, providing a framework for cooperative defense planning and operations between both governments.

Excavation began for the new NORAD Combat Operations Center in Cheyenne Mountain in May 1961. The excavation was nearly complete one year later except for the repair of a geological fault in the ceiling that was completed in May 1964. On February 6, 1966, the NORAD Combat Operations Center attained full operational capability. Operations were transferred from Ent Air Force Base to Cheyenne Mountain on April 20, 1966. In early 1979, the Air Force established a Space Defense Operations Center to counter the emerging Soviet anti-satellite threat. Although the space defense capabilities and systems established in Cheyenne Mountain were in their infancy, this marked the beginning of an increasing role in space. The evolution continued into the 1980s when Air Force Space Command (AFSPC) was created and tasked with the Air Force space mission. AFSPC formed the Space Combat Operations, which absorbed control of the space/missile warning activities in Cheyenne Mountain. In April 1981, Space Defense Operations Center crews and their worldwide sensors, under the direction of Air Defense Command, supported the first flight of the space shuttle. Cheyenne Mountain has continued to support every shuttle mission since. In the latter part of the 1980s, the air sovereignty mission received renewed emphasis and continues to play a role today in working with United States and Canadian Customs Agencies. The Air Defense Operations Center uses its air defense network to provide surveillance and control of air operations and unknown traffic.

Electricity for CMAFS comes primarily from the city of Colorado Springs and Western Area Power Administration (WAPA), with six 1,750 kilowatt diesel generators for backup.

1.4 INSTALLATION MISSION

The host unit at CMAFS is the 721st Mission Support Group (MSG), which is an element of 21st Space Wing and AFSPC. The primary mission of 721st MSG is to provide and operate secure, survivable systems and facilities for all tenant units including elements of United States Northern Command (USNORTHCOM), NORAD, United States Strategic Command (STRATCOM), Air Force Technical Applications Center (AFTAC), and Defense Intelligence Agency (DIA). CMAFS provides critical support for US air defense, space surveillance, and missile warning missions and the 721st MSG directs all support operations, maintenance, and testing for Cheyenne Mountain's integrated tactical warning and attack assessment systems (ITW/AA).

1.5 PURPOSE AND NEED FOR THE PROPOSED ACTION

In response to the energy crisis, Congress passed the Energy Policy Act of 2005 (EPACT) (Public Law 109-58), which was signed by President George W. Bush on August 8, 2005. The Act, in part, requires that the President, acting through the Secretary of Energy, seek and ensure that, to the extent feasibility and technically practicable, the total amount of electric energy the federal government consumes during any fiscal year should be:

- Not less than 3 percent renewable energy in fiscal years 2007 through 2009;
- Not less than 5 percent renewable energy in the fiscal years 2010 through 2012; and
- Not less than 7.5 percent renewable energy in the fiscal year 2013 and beyond.

Section 203(a) of the EPACT 2005 (42 U.S.C. 15852(a) identifies solar power as one of the sources of renewable energy.

The Air Force purchased over 40 percent of the federal governments energy from renewable power in 2008 which surpassed the EPACT mandates by 2 percent. The DOD stated in a memorandum titled Installation Energy Policy Goals, dated November 15, 2005 that each DOD component should strive to aggressively expand the use of renewable energy to a total of 25 percent by the year 2025.

Executive Order (EO) 13423, signed on January 24, 2007 requires agencies to ensure that:

- At least half of the statutorily required renewable energy consumed by the agency in a fiscal year come from renewable sources; and
- To the extent feasible, the agency implements renewable energy generation projects on agency property for agency use.

Outside sources of electric power used by CMAFS are provided by WAPA and by DSM and Renewable Energy Solutions, Colorado Springs Utilities (CSU) which also provides electrical power to the Colorado Springs metropolitan area. The CSU has a mix of self-generated hydroelectric power (34-megawatt [MW]); purchased wind power (1-MW); and customer provided photovoltaic power (189 kilowatts in 2008, and approximately 400 kilowatts in 2009). Colorado Springs Utilities have purchased renewable energy credits (RECs) and are in the process of purchasing 50 MW of electricity from wind generating sources. The CSU has been able to meet their Renewable Energy requirement in 2008 with self-generated hydroelectric power.

WAPA is the preferred source during "peak" consumption times due to lower peak cost. From CSU, power is fed from the Bradley Power Plant, and from the Drake Power Plant, both by underground lines.

The construction and operation of a 1-MW solar array would provide the base with up to 9.5 percent of its required electricity, which would decrease the CMAFS reliance on WAPA and CSU electrical power. The Proposed Action would support the EPACT, increase overall Air Force use of renewable energy, and allow CMAFS to support the DOD installation energy policy long-range goal for renewable energy use.

1.6 RELEVANT STATUTES, REGULATIONS, AND OTHER PLANS

This EA is prepared in compliance with the NEPA (Public Law [PL] 91-190, 1969, as amended), and the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR, 1500-1508, 1993) and 32 CFR, Part 989.

1.7 FEDERAL, STATE, LOCAL PERMITS, AND LICENSES/CMAFS ENVIRONMENTAL PLANS

Implementing this Proposed Action would disturb more than one-acre of soil; consequently, a Construction Storm Water permit from the United States Environmental Protection Agency (U.S. EPA) Region 8 would be required for the construction contactor and CMAFS.

CMAFS plans that are applicable to the Proposed Action and Alternative actions are the CMAFS Energy and Water Conservation Management Plan, CMAFS Integrated Natural Resources Management Plan, CMAFS Integrated Cultural Resources Management Plan, CMAFS Hazardous Waste Management Plan, CMAFS Integrated Contingency Plan, the CMAFS Spill Prevention, Control and Countermeasures Plan, Facilities Excellence Plan and CMAFS General Plan.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action is to install a 1-MW Solar Array at Site 1 on CMAFS. The solar array would be designed for future expansion to a 2-plus MW system and would comply with 2008 National Electric Code (NEC) and National Fire Protection Association (NFPA)-70 criteria. Initially, a 1 MW system encompassing approximately 5,600 solar panels mounted on racks, aligned in access rows, and positioned in a southerly direction and would be located on approximately 10.3 acres as shown on Figure 2-1. The arrays would be embedded into the ground with concrete footings. A small unmanned building, no larger than 1,500 square feet would be built to house inverters and optional battery storage; no heat, water, or sewer would be required for the building. The building would include a containment system to safeguard battery leaks. Inverters would be used to transform direct current (DC) to alternating current (AC). Transformers would be installed to step up voltage so that it is compatible with the CMAFS electrical system. The stepped-up power would then be connected to the CMAFS power distribution system. Security fencing would completely surround the solar array site.

The solar array would tie into the CMAFS electrical system through a 15 kilovolt ampere (kVA) switch. The switch would feed the Cheyenne Mountain Complex electrical system. This would protect the integrity of the CMAFS system during electrical failures and lightning strikes. The power from the solar array would be designed to continuously feed power to the CMAFS electrical system should the CSU and WAPA electrical power feed fail. All power produced from the solar array would be used by CMAFS. It is estimated that the system would meet approximately 4.5 percent of the CMAFS electrical power demands. An electric meter would be placed where the power connects to the CMAFS system to provide the CSU and WAPA new metering requirements. Concrete encased conduit connecting the solar panel arrays to the switch would be placed underground in trenches that could be as deep as 5 feet in some areas, but typically no deeper than 3 feet, and covered with earth. Following emplacement of the conduit, disturbed areas would be graded to maintain current drainage patterns. Transformers would be located at least 100 feet away from other facilities. Regular cleaning of the solar panels would be accomplished by either rinsing with water, blowing with compressed air, or a combination of both. All solid waste generated during construction would be removed by the contractor and disposed of at an appropriate disposal facility outside of CMAFS.

This placement of the solar array at Site 1 would be designed to accommodate future expansion to a 2-plus MW system.

2.2 ALTERNATIVE A

Alternative A would be the same as the Proposed Action except for the location of the solar array. Under Alternative A the solar array would be located at Site 2. Site 2 as shown on Figure 2-1 would comprise approximately 10.1 acres.

2.3 ALTERNATIVE B

Alternative B would be the same as the Proposed Action except for the location of the solar array. Under Alternative B the solar array would be located at Site 3. Site 3 as shown on Figure 2-1 would comprise approximately 17.2 acres.

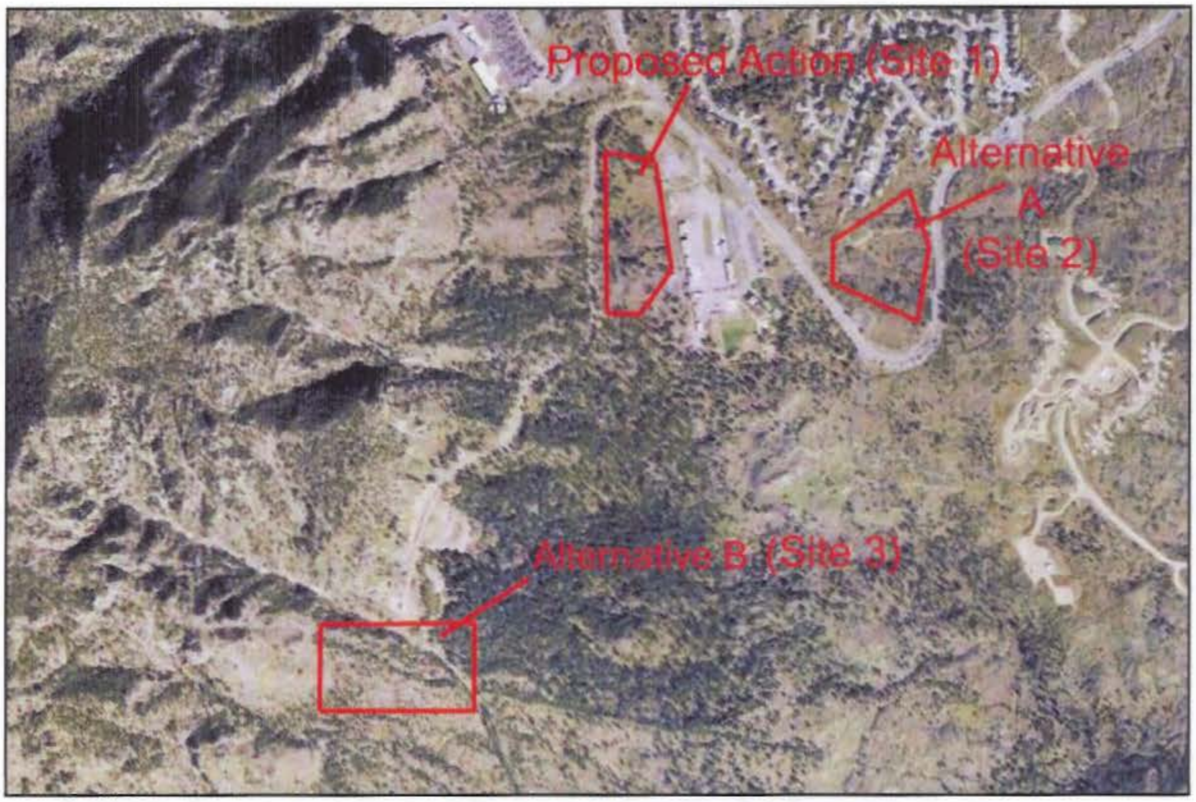

Figure 2-1 Proposed Action and Alternative Site Locations

2.4 NO-ACTION ALTERNATIVE

Under the No-Action Alternative the solar array would not be constructed at CMAFS. The base would not meet the DOD and Air Force goals for use and generation of renewable energy sources.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER REVIEW

Because CMAFS is only 568 acres and is predominately rocky mountainous terrain with slopes up to 90 percent grade, there is limited space for construction of a solar array system or other facilities without creating a visual impact on the area. The Air Force considered construction and operation of a wind turbine; however, a wind turbine needed to provide over 1-MW would be extremely large. For example the widely used General Electric 1.5-MW model, consists of 116-foot long blades atop a 212-foot high tower for a total height of 328 feet. The blades sweep a vertical airspace of just under an acre. Another model being seen more in the United States is the 2-MW Gamesa G87 from Spain, which sports 143-foot long blades (just under 1.5 acres) on a 256-foot tower, totaling 399 feet. Many existing models and new ones being introduced reach well over 400 feet high. Additionally, since the average wind speed is less than 10 miles per hour, the efficiency of a wind turbine would be less than optimal because wind power is in the poor to marginal range west of Colorado Springs (United States Department of Energy and National Renewable Energy Laboratory 2004).

2.6 COMPARISON OF ALTERNATIVES

Table 2-1 summarizes the potential effects of the Proposed Action and Alternatives on natural and human resources.

Table 2-1

Summary of Potential Effects of the Proposed Action and Alternatives

Resource Areas	Proposed Action	Alternative A	Alternative B	No-Action Alternative
AICUZ	N/A	N/A	N/A	None
Airspace	N/A	N/A	N/A	None
Air Quality	—	—	—	None
Biological Resources				
• Vegetation	—	—	—	None
• Wildlife	—	—	—	None
T&E/Special Concern Species	0	0	0	None
Cultural Resources	0	0	0	None
Hazardous Materials	0	0	0	None
Hazardous Waste	0	0	0	None
Land Use	0	0	0	None
Noise	—	—	—	None
Safety and Occupational Health	0	0	0	None
Socioeconomics	+	+	+	None
Utilities	+	+	+	None
Water Resources	0	0	0	None

Notes:
AICUZ – Air Installation Compatibility Use Zones
T&E – Threatened and Endangered
X - Significant impact
— - Adverse, but not significant impact
+ - Positive, beneficial impact
0 - No change
N/A – Not applicable

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3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing environmental conditions at CMAFS for resources potentially affected by the Proposed Action and Alternatives as described in Chapter 2.0. In compliance with guidelines contained in NEPA, CEQ regulations, and the requirements of 42 U.S.C. 4321-4347, CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR § 1500-1508), and 32 CFR Part 989, *et seq.*, *Environmental Impact Analysis Process* (formerly known as Air Force Instruction [AFI] 32-7061), the description of the existing environment focuses on those environmental resources potentially subject to impacts. These resources and conditions are: Air Quality, Biological Resources, Cultural Resources, Climate, Hazardous Materials, Hazardous Waste, Solid Waste, Land Use, Utilities, Infrastructure, Noise, Socioeconomics/Environmental Justice and the Protection of Children, Visual/Aesthetics, and Water Resources. The expected geographic scope of potential impacts, known as the ROI, is defined for each resource analyzed.

3.1 AIR QUALITY

The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division (APCD) is the primary Colorado authority for protecting air quality in the state under the Colorado Air Pollution Prevention and Control Act. Included in the APCD standards are National Ambient Air Quality Standards for six criteria pollutants that the U.S. EPA is required to monitor: sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead (Pb).

The ROI for air quality varies according to the type of air pollutant being discussed. Primary pollutants, such as CO and directly emitted particulate matter, have a localized region of effects generally restricted to the immediate vicinity of the source of emissions. Secondary pollutants, such as O_3 and carbon dioxide (CO_2), have a broader region of effects.

Air pollutants that are covered by adopted federal ambient air quality standards are called criteria air pollutants (see Section 3.1.1.1–National and State Air Quality Standards). In addition to the six criteria air pollutants covered by federal ambient air quality standards, a large number of compounds have been designated as hazardous air pollutants, which are regulated primarily by emission limits on specific types of industrial emission sources. Greenhouse gases (GHG) are another air pollutant category of general concern. Greenhouse gases are compounds in the atmosphere that absorb infrared radiation and radiate a portion of that radiation toward the earth's surface, thus trapping heat and warming the atmosphere. The most important GHG compounds are CO_2, methane (CH_4), and nitrous oxide (N_2O). The overall global warming potential of GHG emissions is typically presented in terms of CO_2 equivalents (CO_2e), using equivalency factors developed by the Intergovernmental Panel on Climate Change.

3.1.1 Air Quality Standards, Conditions, and Regulatory Considerations

3.1.1.1 National and State Ambient Air Quality Standards

The federal CAA, as amended, authorizes the U.S.EPA to establish national ambient air quality standards to protect public health and welfare. Federal ambient air quality standards have been adopted for six criteria pollutants: O_3, CO, NO_2, SO_2, suspended particulate matter (including inhalable particulate matter [PM_{10}] and fine particulate matter [$PM_{2.5}$]), and airborne Pb. Table 3-1 shows the federal and Colorado Ambient Air Quality Standards.

Table 3-1

NAAQS, CAAQS, and Prevention of Significant Deterioration (PSD) Significant Monitoring Concentrations

Pollutant	Average Period	Primary NAAQS	Secondary NAAQS	(Additional Standards) CAAQS	PSD Significant Monitoring Concentration[1]
Nitrogen dioxide	Annual	0.053 parts per million (ppm)(100 micrograms per cubic meter [µg/m^3])	0.053 ppm (100 µg/m^3)	100 µg/m^3	14 µg/m^3
Carbon monoxide	1-hour	35 ppm (40,000 µg/m^3)	NA	40,000 µg/m^3	NA
Carbon monoxide	8-hour	9 ppm (10,000 µg/m^3)	NA	10,000 µg/m^3	575 µg/m^3
Sulfur dioxide	3-hour	NA	0.5 ppm(1,300 µg/m^3)	700 µg/m^3	NA
Sulfur dioxide	24-hour	0.14 ppm(365 µg/m^3)	NA	NA	13 µg/m3
Sulfur dioxide	Annual	0.030 ppm (80 µg/m^3)	NA	NA	NA
Ozone	1-hour	Rescinded	Rescinded	235 µg/m^3	100 tpy VOCs
Ozone	8-hour	0.05 ppm(147 µg/m^3)	0.075 ppm(147 µg/m^3)	NA	100 tpy VOCs
Particulate matter <10 µm (PM_{10})	24-hour	150 µg/m^3	150 µg/m^3	150 µg/m^3	10 µg/m^3
PM_{10}	Annual	Rescinded	Rescinded	50 µg/m^3	NA
$PM_{2.5}$	24-hour	35 µg/m^3	35 µg/m^3	NA	NA
$PM_{2.5}$	Annual	15 µg/m^3	15 µg/m^3	NA	NA
Lead	Quarterly	1.5 µg/m^3	1.5 µg/m^3	NA	0.1 µg/m^3
Lead	Monthly	NA	NA	1.5 µg/m^3	NA
Fluorides	24-hour	NA	NA	NA	0.25 µg/m^3
Total reduced sulfur	1-hour	NA	NA	NA	10 µg/m^3
Hydrogen sulfide	1-hour	NA	NA	NA	0.2 µg/m^3
Reduced sulfur compounds	1-hour	NA	NA	NA	10 µg/m^3

Table 3-1, Page 1 of 2

Source: Colorado Department of Public Health and Environment (CDPHE) 2005, U.S. EPA 2009

Table 3-1 (Continued)

NAAQS, CAAQS, and Prevention of Significant Deterioration (PSD)

Significant Monitoring Concentrations

Notes: 1-The significant monitoring concentrations (lowest levels) apply only to new sources and modifications.
CAAQS – Colorado Ambient Air Quality Standards
$\mu g/m^3$- microgram per cubic meter
NAAQS – National Ambient Air Quality Standards
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$– particulate matter less than 2.5 microns in diameter
ppm- parts per million
tpy – tons per year

3.1.1.2 Air Quality Conditions

The U.S.EPA evaluates whether the criteria air pollutant levels within a geographic area meet national ambient air quality standards. Areas that violate air quality standards are designated as nonattainment areas for the relevant pollutants. Nonattainment areas are sometimes further classified by degree (marginal, moderate, serious, severe, and extreme). Areas that comply with air quality standards are designated as attainment areas for the relevant pollutants. Areas that have been re-designated from nonattainment to attainment are maintenance areas. Areas of uncertain status are generally designated as unclassifiable and are treated as attainment areas. The Colorado Springs area is in attainment for all of six air quality pollutants (Pikes Peak Area Council of Governments [PPACG] 2003). CMAFS has a Synthetic Minor Construction Permit (95EP780) (dated September 1995, modification to Permit dated December 1999, and Final Permit issued 19 July, 2002). Permit limits compared to actual annual emissions from November 2008 to October 2009 are shown in Table 3-2.

Table 3-2

Significant Air Emissions – Permit Limits versus Actual (tons per year)

	PM	PM_{10}	SO_2	NO_x	VOC	CO
Permit 95EP780[1]	5.00	5.00	5.00	82.40	10.00	21.63
2009 Actual[2]	0.16	0.16	0.08	4.97	0.12	1.32

Notes: 1 – Final Permit issued July, 2002
2 – October 2009; 12 month rolling summary

CO–carbon monoxide
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$– particulate matter less than 2.5 microns in diameter
SO_2–sulfur dioxide
NO_x – nitrogen oxides
VOC – volatile organic compounds

3.1.1.3 Clean Air Act Conformity Guidelines

Section 176(c) of the federal CAA contains requirements that apply specifically to federal agency actions, including actions receiving federal funding. This section of the CAA requires federal agencies to ensure that their actions are consistent with the CAA and with applicable state air quality management plans.

Federal agencies are required to evaluate their proposed actions to make sure that they will not cause or contribute to new violations of any federal ambient air quality standards, that they will not increase the frequency or severity of any existing violations of federal ambient air quality standards, and that they will not delay the timely attainment of federal ambient air quality standards.

The U.S.EPA general conformity rule requires a formal conformity determination document for federally sponsored or funded actions in nonattainment or maintenance areas when the net increase in direct and indirect emissions of nonattainment or maintenance pollutants exceeds specified *de minimis* thresholds. The *de minimis* threshold for CO is 100 tons per year. Since the Colorado Springs area is within a CO maintenance area, a formal conformity determination is required for the Proposed Action.

3.2 BIOLOGICAL RESOURCES

3.2.1 Vegetation

CMAFS is characterized by two distinct native plant communities—oak scrub and pine woodlands—and two transitional communities. The four plant communities are the Oak-Pine Woodland, Oak Scrub, Pine Woodland/Rock, and Pine Woodland (Figure 3-1). They cover approximately 480 acres (194 hectares), or 85 percent, of CMAFS; the remaining 15 percent of the installation represents improved and semi-improved areas and include manmade and maintained structures, roads, parking lots, and lawns.

Distribution of the four native plant communities is controlled by soil depth, aspect, soil moisture levels, elevation, and topography. The percentage of forested community is shown in Table 3-3.

Table 3-3 Forested Community at CMAFS

Vegetation Type	Acres/Hectares	Percentage of Total Cover
Oak Scrub	122/49	25
Pine Woodland	107/43	22
Oak-Pine Woodland	134/54	29
Pine Woodland/Rock	117/47	24
Total	**480/194**	**100**

Other vegetation of interest at CMAFS includes noxious weeds, several species of which have been mapped and are discussed in Section 3.2.1.5.

3.2.1.1 Oak Scrub

The oak scrub community is most common at elevations below 6,750 feet (2,057 meters) MSL and represents a traditional zone between grassland and montane communities. It covers approximately 122 acres (49 hectares), or 25 percent of the undeveloped land at CMAFS. The predominant species is Gambel oak (*Quercus gambelii*). Other species observed in this community include ponderosa pine (*Pinus ponderosa*), mountain mahogany (*Cercocarpus montanus*), bitterbrush (*Purshia tridentata*), skunkbush (*Rhus americana*), Arizona fescue (*Festuca arizonica*), and blue grama (*Bouteloua gracilis*). In the wetter locations, such as canyon bottoms, occasional willows (*Salix* spp.) and plains cottonwoods (*Populous sargentii*) have been observed. At CMAFS, the shrub-like Gambel oak averages in height from 6 to 10 feet (2 to 3 meters) and typically grows in dense thickets. The density of grasses growing at ground level varies inversely with the density of scrub oak, ranging from moderately abundant to

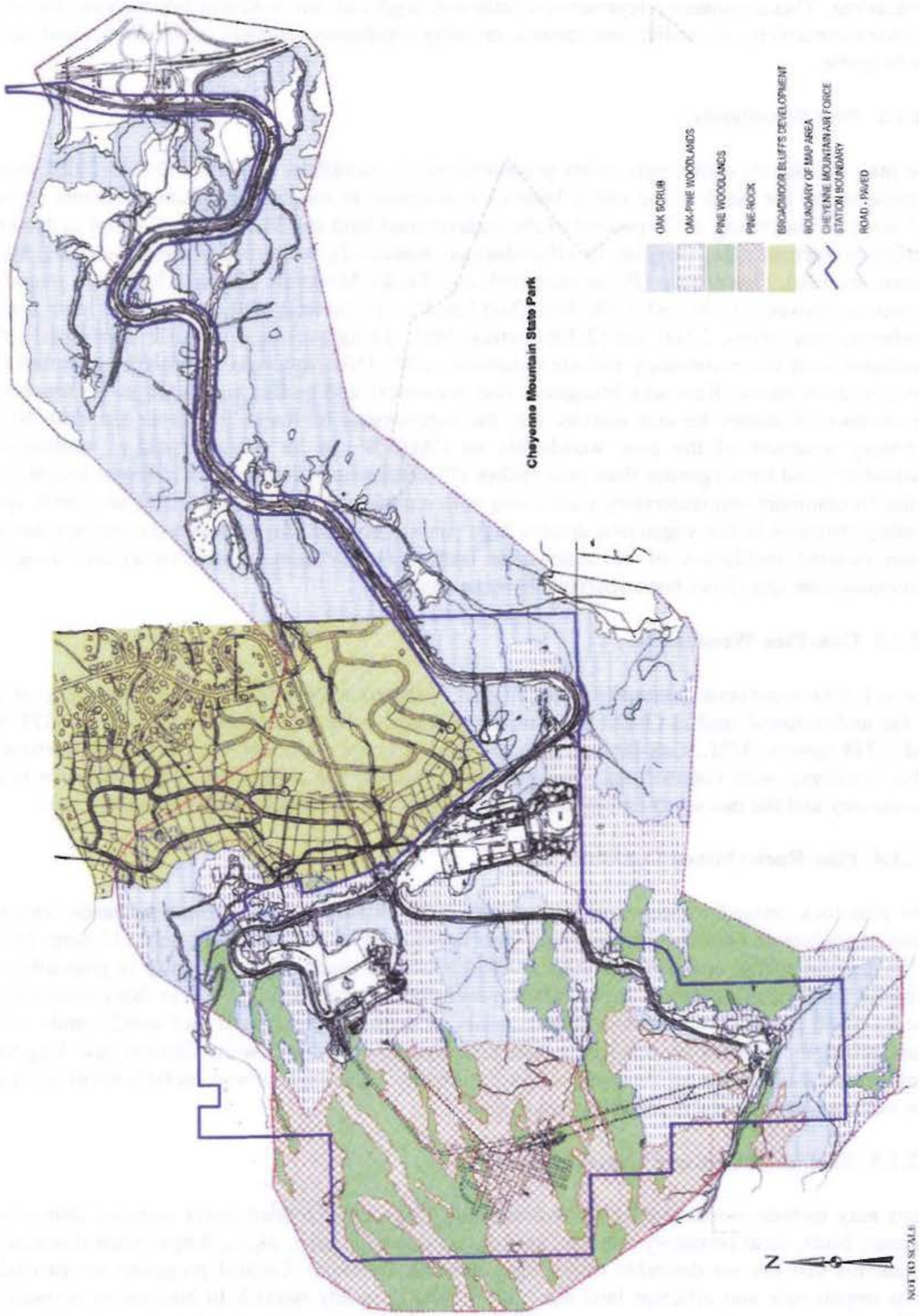


Figure 3-1 Vegetation Communities at CMAFS

nonexistent. This community represents a relatively high risk for wildland fire because the oak thickets provide connectivity to conifer tree crowns, creating conditions whereby crown fires could occur were a fire to ignite.

3.2.1.2 Pine Woodlands

The pine woodlands community exists predominately at elevations above 6,750 feet (2,057 meters) MSL in areas where the depth of the soil to bedrock is adequate to support vegetation. It covers approximately 107 acres (43 hectares), or 22 percent of the undeveloped land at CMAFS. Trees found in this community include ponderosa pine, Douglas fir (*Pseudotsuga menziesii*), white fire (*Abies concolor*), Siberian elm (*Ulmus pumila*), blue spruce (*Picea pungens*), and Rocky Mountain juniper (*Juniperus scopulorum*). At elevations between 6,750 and 7,500 feet (2,057 and 2,286 meters) MSL, the predominant species is the ponderosa pine; above 7,500 feet (2,286 meters) MSL, Douglas fir and white fir dominate. Other plants associated with this community include mountain muhly (*Muhlenbergia montana*), cinquefoil (*Potentilla* spp.), Arizona fescue, Kentucky bluegrass (*Poa pratensis*), and golden ragwort (*Senecio fendleri*). Due to the absence of timber harvest activity and the suppression of forest fires over the past 50 years, the overstory structure of the pine woodlands on CMAFS can be characterized as multiaged. Mature sawtimber-sized trees (greater than nine inches [23 centimeters] in diameter at breast height) are present in the co-dominant and understory sizes along with a variety of miscellaneous tree and shrub species. The existing structure to the vegetation creates high canopy connectivity between the various canopy layers. Some isolated incidences of mountain pine beetle (*Dendroctonus ponderosae*) and dwarf mistletoe (*Arceuthobium* spp.) have been observed in these areas.

3.2.1.3 Oak-Pine Woodlands

The oak-pine woodlands community, which covers approximately 134 acres (54 hectares), or 29 percent of the undeveloped land at CMAFS, is primarily between the elevations of 6,625 and 7,375 feet (2,019 and 2,248 meters) MSL. Oak-pine woodlands, a transitional community, consist of ponderosa pine (and other conifers), with Gambel oak interspersed throughout the understory. The difference between this community and the oak scrub community is the density ratio of conifer trees to Gambel oak.

3.2.1.4 Pine-Rock (Mixed Conifer-Rock)

The pine-rock (mixed conifer-rock) community is an extension of the pine woodlands community into areas of shallow to nonexistent soil cover. This community covers approximately 117 acres (47 hectares), or 24 percent of the undeveloped land at CMAFS. The pine rock community is primarily in areas of exposed bedrock at elevations above 7,500 feet (2,286 meters) MSL. Slopes in this community can be in excess of 80 percent. Native vegetation consists of scattered individuals and small stands of coniferous trees, primarily Douglas fir, ponderosa pine, and white fir, as well as some Gambel oak. Vegetation cover ranges from 0 to 60 percent throughout this community. Detailed surveys on both structure and health of this community have not been conducted to date.

3.2.1.5 Noxious Weeds and Vegetative Pests

Pests may include weeds (terrestrial and aquatic), insects and related lower animals, domestic and feral rodents, birds, feral predatory animals, snakes, nematodes, snails, algae, fungal plant diseases, and other organisms that are not desirable (other than domestic animals). Control programs are carried out when pests impair safe and efficient land use, pose health or safety hazards to humans or animals, or impair military operations. Programs for controlling or eradicating noxious weeds are mandatory and must be

coordinated with state and local agencies. Integrated pest management procedures are to be used when practicable. Management must ensure that pests are controlled effectively and economically, while minimizing contamination of the environment and risks to human health. Several insect pests are prevalent in the forests of the Front Range, including species of bark beetles, spruce budworms, and Douglas fir tussock moths. Of primary concern at CMAFS are the parasitic plant dwarf mistletoe and, to a lesser degree, mountain pine beetles. These pests can damage and kill coniferous trees and may occur in widespread epidemics. Seven invasive plant species have been identified at CMAFS, primarily in undeveloped areas and on the periphery of improved/semi-improved areas:

- Canada thistle (*Cirsium arvense*);
- Musk thistle (*Carduus nutans*);
- Russian thistle (*Salsola kali*);
- Russian olive (*Elaeagnus angustifolia*);
- Field bindweed (*Convolvulus arvensis*);
- Cheatgrass (*Bromus tectorum*); and
- Kochia (*Kochia scoparia*).

Infestations have the potential to adversely impact the success of natural resources management activities targeted at soil erosion control and revegetation. Invasive plant species also pose threats to native habitats, endangered species, and plant community composition and diversity. Invasive species can out-compete native species, resulting in a monoculture of undesirable unsightly vegetation. As a consequence, CMAFS is committed to monitoring levels and controlling these insect pests and invasive plant species, as warranted, to avert potential effects.

3.2.2 Wildlife

Wildlife present at CMAFS includes species that are typical of the foothills area of the Front Range of Colorado. Complete wildlife surveys have not been conducted, but the Natural Resources Management Plan (CMAFB 1991), a biodiversity study (CMAFS 1995), and a baseline survey of avifauna (birds) (Engineering and Environment Inc. 2005) identified a number of species that have been observed on CMAFS.

3.2.2.1 Mammals

Mammals commonly seen at CMAFS include mule deer (*Odocoileus hemionus*) and a variety of small mammals, such as raccoons (*Procyon lotor*), fox squirrels (*Sciurus niger*), Abert's squirrels (*S. aberti*), red squirrels (*Tamiasciurus hudsonicus*), and striped skunks (*Mephitis mephitis*) (CMAFS 1995). No studies of mule deer populations at CMAFS have been conducted, but observations made by Kufeld et al. (1989) of mule deer inhabiting a similar setting approximately 140 miles (225 kilometers) north of CMAFS probably apply to local herds. According to Kufeld, mule deer living in the Front Range area are resident throughout the year and do not make seasonal migrations to higher or lower elevations. Home ranges are relatively small, from about 290 to 800 acres (117 to 324 hectares) because of habitat conditions and abundant food supplies. According to state wildlife biologists, most mule deer move in a north-south direction along the Front Range. Relatively few deer move west over the mountains (CMAFB 1991). A small colony of black-tailed prairie dogs (*Cynomys ludovicianus*) occurs near the CMAFS entrance and extends onto the right-of-way from surrounding property. Less conspicuous mammals

observed at CMAFS include black bears (*Ursus americanus*), coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), grey foxes (*Urocyon cinereoargenteus*), bobcats (*Felis rufus*), and mountain lions (*F. concolor*).

3.2.2.2 Birds

A preliminary baseline survey of birds at CMAFS was conducted in August 2005 (Engineering and Environment 2005). Thirty-nine species of birds were detected during the survey time frame. None of the species detected were federally or state listed as threatened or endangered, although most are protected under the Migratory Bird Treaty Act (MBTA). All observed species are common residents of the habitat associations that are present on CMAFS. Rufous hummingbirds (*Selasphorus rufus*), mountain chickadees (*Poecile gambeli*), and Steller's jay (*Cyanocitta stelleri*) were among some of the most commonly observed species on the installation. Some individuals that were detected during this survey were likely early fall migrants and not necessarily resident breeders. The most notable find during this survey was the discovery of a nesting pair of golden eagles (*Aquila chrysaetos*) observed on a cliff face in the northernmost canyon on CMAFS at approximately 8,000 feet MSL(2,438 meters). Both parents were observed visiting the nest, and at least one eaglet was heard begging for food. Golden eagles are protected under the Bald and Golden Eagle Protection Act. Peregrine falcons (*Falco peregrinus*), a state species of concern and a federally delisted species, also have been observed nesting in the general vicinity around CMAFS. At CMAFS, wild turkeys (*Meleagris gallopavo*) are common in groups of approximately 10 to 15 birds, although groups as large as 40 birds have been observed. The Gambel oak/ponderosa pine habitat is well suited to turkeys (Hoffman 1962). According to state wildlife biologists, turkeys in the area are rather mobile and may move as far as 3 to 5 miles (5 to 8 kilometers) per day and 30 to 40 miles (48 to 64 kilometers) over longer periods (CMAFB 1991).

3.2.3 Special Status Species (Threatened and Endangered Species)

No threatened or endangered species of plants or animals have been detected at CMAFS to date. In 1994, a biodiversity study was conducted to establish a baseline inventory for rare, threatened, and endangered flora and fauna at CMAFS, focusing on their presence, status and habitat locations (CMAFS 1995). The biodiversity study consisted of a literature search followed by field surveys during the fall and winter of 1994. Field surveys for rare plants consisted of foot surveys of all major vegetations types, with emphasis on areas of high soil moisture and humidity, including drainage channels and beneath conifer forest canopies. Ravines with seasonal runoff were surveyed because of their potential habitat for mesic and hydric species having limited distribution on the eastern slope of the Front Range. Rock outcrops were also surveyed for the presence of rare species. Animal surveys were conducted using standard techniques. Small mammals were surveyed using live traps and pitfall traps for shrews along transect lines in two main locations at CMAFS, which were considered to be representative of the major vegetation communities. Spotting scope surveys were used to locate nesting/roosting raptors. Walkover surveys were conducted to determine the presence of reptiles, amphibians and larger mammals. Although this survey is dated, the conditions have not changed significantly and the study is still considered to be valid.

3.2.3.1 Federally Listed Species

Per the Endangered Species Act (ESA), the United States Fish and Wildlife Service (USFWS) maintains lists of plants and animals classified as threatened and endangered. The federally listed species that potentially occur in El Paso County are listed in Table 3-4. Of the federally listed species in the vicinity of CMAFS, only the Mexican spotted owl (*Strix occidentalis lucida*) has suitable habitat present at CMAFS. Suitable habitat has been documented in the North Canyon of CMAFS based on the presence of a dense mixed conifer forest. With the exception of length (the canyon at CMAFS is shorter), the

conditions in this canyon are similar to conditions in canyons to the south where owls have been observed. No Mexican spotted owls, however, have been identified to date at CMAFS.

In 2005, the preliminary baseline survey of avifauna focused on identifying any Mexican spotted owls and suitable habitat at CMAFS (Engineering and Environment 2005). Conducted in mid-August, field survey methods included unlimited distance point count sampling, general area searches (focused on canyons), and nocturnal owl call back surveys. Critical habitat for the Mexican spotted owl has been designated in Colorado. No critical habitat exists on CMAFS; however, it is designated on other federal lands (United States Forest Service [USFS]) adjacent to the CMAFS boundary.

Table 3-4

Federally Listed Species in the Vicinity of CMAFS

Common Name	Scientific Name	Status	Comments
	Birds		
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Suitable habitat present
Whooping crane	*Grus americana*	Endangered	No suitable habitat
Interior least tern	*Sterna antillarum athalassos*	Endangered	No suitable habitat
Piping plover	*Charadrius melodus*	Threatened	No suitable habitat
	Mammals		
Black-footed ferret	*Mustela nigripes*	Endangered	No suitable habitat
Gunnison's prairie dog	*Cynomys gunnisoni*	Candidate	No suitable habitat
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened	No suitable habitat
	Fish		
Greenback cutthroat trout	*Salmo clarkii stomias*	Threatened	No suitable habitat
Arkansas darter	*Etheostoma cargini*	Candidate	No suitable habitat
Pallid sturgeon	*Scaphirhychus albus*	Endangered	No suitable habitat
	Plants		
Colorado Butterfly Plant	*Gaura neomexicana* spp. *Coloradensis*	Threatened	No suitable habitat
Ute Ladies'-tresses	*Spiranthes diluvalis*	Threatened	No suitable habitat

3.2.3.2 State Listed Species

Title 33 of the Colorado State Statutes (Colo. Rev. Stat. Ann. §§ 33-2-102-106) identifies the State's intent to protect endangered, threatened or rare species. The Colorado Department of Wildlife (CDOW) maintains a list of animal species that are threatened or endangered in the state. In addition, the state recognizes species of special concern that potentially warrant state protection. Several of these species have suitable habitat present or potentially present at CMAFS (Table 3-5). Those species are the bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl(*Strix occidentalis lucida*), burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), mountain plover (*Charadrius montanus*), long-billed curlew (*Numenius americanus*), peregrine falcon, black-footed ferret(*Mustela nigripes*), and swift fox

(*Vulpes velox*). Of these species with potential habitat occurring on CMAFS, only the peregrine falcon has been identified within the immediate vicinity.

Table 3-5

State Listed Species in the Vicinity of CMAFS

Common Name	Scientific Name	Status	Comments
	Birds		
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Suitable habitat within 5 miles of CMAFS
Mexican Spotted Owl	*Strix occidentalis lucida*	Threatened	Suitable habitat present
Whooping Crane	*Grus Americana*	Endangered	No suitable habitat
Interior Least Tern	*Sterna antillarum athalassos*	Endangered	No suitable habitat
Burrowing Owl	*Athene cunicularia*	Threatened	Suitable habitat present in grasslands
Western Snowy Plover	*Charadrius alexandrinus nivosus*	State Special Concern	No suitable habitat
Ferruginous Hawk	*Buteo regalis*	State Special Concern	Suitable habitat potentially present
Mountain Plover	*Charadrius montanus*	State Special Concern	Suitable habitat present in grasslands
Long-billed Curlew	*Numenius americanus*	State Special Concern	Suitable habitat present in grasslands
Peregrine Falcon	*Falco peregrinus*	State Special Concern	Suitable habitat present on cliffs to the west; Previously observed at CMAFS
	Mammals		
Black -footed ferret	*Mustela nigripes*	Endangered	No suitable habitat
Swift Fox	*Vulpes velox*	State Special Concern	Suitable habitat present in grasslands
	Amphibians		
Northern Leopard Frog	*Rana pipiens*	State Special Concern	No suitable habitat
	Fish		
Greenback Cutthroat Trout	*Salmo clarki stomias*	Threatened	No suitable habitat
Arkansas Darter	*Etheostoma cragini*	Threatened	No suitable habitat
Southern Redbelly Dace	*Phoxinus erythrogaster*	Endangered	No suitable habitat

3.2.3.3 Rare and Sensitive Species

The Colorado Natural Heritage Program (CNHP), the State's primary repository of information describing biological diversity, publishes lists of rare and imperiled animals, plants and natural communities (CNHP 1995).

These lists include species protected by state listing and, as appropriate, federal listing, as well as species determined by the CNHP to be critically imperiled. The CNHP ranks species in terms of relative degree of imperilment primarily on the basis of occurrences but also on the size of geographic range, number of individuals, population trends, and distribution, identified threats, and the number of already protected occurrences. Listing and ranking of a species by the CNHP does not affect or determine its protected status; however, it does give an indication of biological diversity issues that may be of importance at CMAFS. Rare and sensitive species in the vicinity of CMAFS are listed in Table 3-6.

Table 3-6

Rare and Sensitive Species in the Vicinity of CMAFS

Common Name	Scientific Name	CNHP Ranking	Comments
Birds by Habitat (USFWS Birds of Conservation Concern and PIF Priority Species)			
Cliff/Rock			
Peregrine falcon	*Falco peregrinus*	G4 S2	Suitable habitat present on cliffs west of CMAFS
Golden eagle	*Aquila chrysaetos*	NA	Suitable habitat present; Previously observed at CMAFS
Prairie falcon	*Falco mexicanus*	G5 S4	Suitable habitat present; Previously observed at CMAFS
Ponderosa Pine			
Band-tailed pigeon	*Columbia fasciata*	NA	Suitable habitat present
Flammulated owl	*Otus flammeolus*	NA	Suitable habitat present
Mexican spotted owl	*Strix occidentalis lucida*	G3 S1	Suitable habitat present
Lewis' woodpecker	*Melanerpes lewis*	G4 S4	Suitable habitat present
Mountain Shrub			
Virginia's warbler	*Vermivora virginiae*	NA	Suitable habitat present; Previously observed at CMAFS
Green-tailed towhee	*Pipilo chlorurus*	G5 S5	Suitable habitat present

Table 3-6, Page 1 of 2

Table 3-6 (Continued)

Rare and Sensitive Species in the Vicinity of CMAFS

Common Name	Scientific Name	CNHP Ranking	Comments
Mammals (CNHP S1, S2 and S3)			
Plains pocket mouse	*Perognathus flavescens relictus*	G5 S2	Suitable habitat potentially present
Fringed myotis	*Myotis thysanodes*	G4-G5 S3	Suitable habitat present
Dwarf shrew	*Sorex nanus*	G4 S2	Suitable habitat potentially present
Merriam's shrew	*S. merriami*	G5 S3	No suitable habitat
Plants			
Slender moonwort	*Botrychium lineare*	G1 S1	Suitable habitat potentially present
Rattlesnake fern	*Botrypus virginianus* spp. *europaeus*	G5 S1	No suitable habitat
Birdbill dayflower	*Commelina dianthifolia*	G5 S1?	Suitable habitat potentially present
Yellow lady-slipper	*Cypripedium calceolus* spp. *Parviflorum*	G5 S2	Suitable habitat potentially present
Wood lily	*Lilium philadelphicum*	G5 S3-S4	No suitable habitat
Purple cliff-brake	*Pallaea atropurpurea*	G5 S3-S4	No suitable habitat
American currant	*Ribes americanum*	G5 S2	Suitable habitat potentially present
Carrionflower	*Smilax lasioneuron*	G5 S3-S4	Suitable habitat present
James telesonix	*Telesonix jamesii*	G2 S2	Suitable habitat present
Prairie goldenrod	*Unamia alba*	G5 S2-S3	Suitable habitat potentially present

Table 3-6, Page 2 of 2

Notes: *The Colorado Natural Heritage Program (CNHP) conservation status of a species or community is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, N = National, and S = Sub-national). The numbers have the following meaning:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure
N/A – not applicable
PIF – Partners in Flight
USFWS – United States Fish and Wildlife Service

While the MBTA protects all migratory birds, the USFWS Birds of Conservation Concern list is intended to identify species, subspecies, or populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA (USFWS 2002). Species identified to date at CMAFS from the USFWS Region 6 Birds of Conservation Concern 2002 list include the golden eagle, prairie falcon, and Virginia's warbler (*Vermivora virginae*). In 2006, the DOD and the USFWS signed a memorandum of understanding to promote the conservation of migratory birds in response to Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. In addition, Priority Species have been identified by the Partners in Flight (PIF) by physiographic region and habitat. The PIF Land Birds Conservation Plan for Colorado identifies priority species, conservation opportunities and implementation strategies (Partners in Flight [PIF] 2000).

3.3 CLIMATE

The climate at CMAFS is characterized by hot summers and cold winters. During the winter (December through February), the average temperature is 31 degrees Fahrenheit (°F)/ minus 1 degree Centigrade (-1°C), and the average minimum temperature is 18°F (-8°C). In the summer (June through August), the average temperature is 68°F (20°C), and the average maximum temperature is 82°F (28°C). The regional growing season is approximately 4.5 months and extends from the average last freeze in mid-May to the average first freeze in late September. Annual precipitation in the Colorado Springs area is approximately 15 inches (38 centimeters), most of which occurs as rainfall between April and September. Summer storms tend to be violent isolated thunderstorms accompanied by hail, lightening, and high winds. The average snowfall is 42 inches (107 centimeters) per year. The average relative humidity is low and averages below 40 percent during daytime (11:00 AM to 5:00 PM). The average wind speed in the Colorado Springs area is 10 miles per hour. The annual sky cover is 30 percent (National Oceanic and Atmospheric Administration [NOAA] 2009) with the amount of available sunshine varies from 9:30 to 14:45 hours per day (December and June) (Time and Date.com 2009).

3.4 CULTURAL RESOURCES

A cultural resources survey conducted in 1990 by an archeologist that met standards for the profession established by the United States Secretary of the Interior found no evidence of pre-historic archeological sites at CMAFS. As such, there are no current requirements to perform archeological surveys at CMAFS. Historic resources at CMAFS can be categorized by those preceding the construction of CMAFS (Pre-1961) and those dating after the construction of CMAFS (post-1961). Surveys conducted in 1990 did not identify any historic resources from a time period before 1961. An inventory and National Register of Historic Places (NRHP) evaluation of buildings and structures dating post-1962 was completed in 2003. That report concluded that a district eligible for inclusion on the NRHP was present at CMAFS, one that included 18 contributing buildings and features. The district and contributing buildings and structures are considered to be eligible in the NRHP on the basis of their association with the Cold War. Consultation with the Colorado State Historic Preservation Officer regarding this evaluation has not yet been completed; however, these buildings and features appear to meet the standard of "exceptional importance" required for properties that are less than 50 years old.

3.4.1 Native American Issues

Native American issues at CMAFS would likely relate to Traditional Cultural Properties (TCPs) or sacred sites. A TCP is defined generally as a historic property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in the community's history; and (b) are important in maintaining the continuing cultural identity of the

community. The community may entail a Native American tribe, a local ethnic group, or the people of the nation as a whole. To date, no TCPs or sacred sites have been identified at CMAFS. Their presence largely will be determined by consultation with Native American groups that may have attached cultural values to landscape features, including Cheyenne Mountain itself. In 2004, CMAFS sent a questionnaire to 46 Native American tribes with 40 tribes responding with expressions of interest. Consultations with these 40 tribes would establish not only whether or not TCPs might be located on the site, but also if there are any sacred sites.

3.5 GEOLOGY AND SOILS

CMAFS is on the eastern flank of Cheyenne Mountain, which is part of the Front Range of the southern Rocky Mountains. The area to the east is semiarid plains, and immediately to the west are mountains with elevations to 14,000 feet (4,267 meters) MSL. The principal topographic features include rocky cliff faces and steep ravines in the western half of the site and broad alluvium-covered slopes in the remainder of the site. The elevation at CMAFS ranges from a maximum of 9,020 feet (2,749 meters) MSL on the western side of the property to a minimum of 6,000 feet (1,829 meters) MSL on the eastern side near Highway 115 at the access to NORAD road. The elevation of most of the exterior facilities ranges from 6,820 to 6,700 feet (2,079 to 2,042 meters) MSL.

There are three principal soil types at CMAFS. The western half of the site (down to an elevation of approximately 7,000 feet [2,134 meters] msl) is characterized by rock outcrops and soils from the Coldcreek (cobbly loam) and Tolman (gravely loam) series. The soil in the Building 300 area is a sandy arkosic loam from the Bresser series (likely underlain by the Post-Piney and Piney Creek Alluvium). The remainder of the site is characterized by soils from the Jarre (gravely-sandy loam) and Tecolote (stony loam) series. Although not shown on geologic maps, some sedimentary rock, including limestone, was observed during field investigations conducted for the Cultural Resources Management Plan. Members of the Pikes Peak Chapter of the Colorado Archeological Society also reported the existence of limestone outcrops in the area.

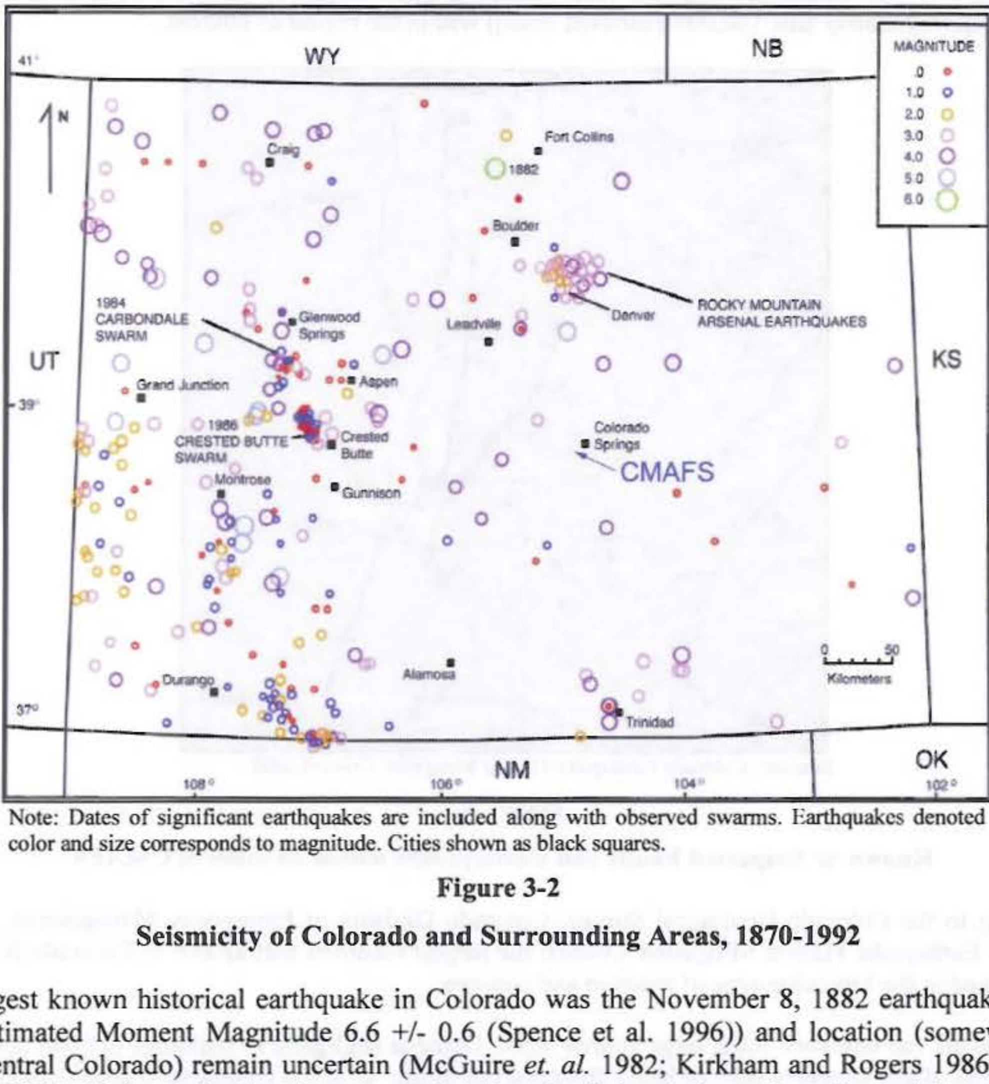
Coldcreek soils are deep and well-drained, with moderate permeability. They typically have a maximum rooting depth of 40 inches (102 centimeters) or more. Tolman soils are shallow and well-drained with a moderate permeability and have an effecting rooting depth of 10 to 20 inches (25 to 50 centimeters). Both are derived from weathered acidic igneous rock and exhibit medium surface runoff and moderate erosion hazard. Bresser soils are deep and well-drained with moderate permeability, formed in Arkosic alluvium and residium, with some clay, on terraces and uplands, and they have an effective rooting depth of 60 inches (152 centimeters) or more. This soil type also has medium surface runoff and moderate erosion hazard. Tecolote soils are deep and well-drained, with moderate permeability, formed in alluvium from acidic igneous rock. The surface typically has 30 to 50 percent cobbles and stones, with an effective rooting depth of 40 inches (102 centimeters) or more. These soils have medium surface runoff and moderate erosion hazard.

Available soil maps do not differentiate between the soils of the Coldcreek and Tolman series or the Jarre and Tecolote series. The Soil Survey of the El Paso, Colorado area presents more detailed information on the soil characteristics, distribution, and potential uses (United States Department of Agriculture [USDA] 1981). For construction purposes, the primary soil factors to consider are erodibility, permeability, and high-water table, elasticity, shrink/swell potential, compactibility, and bearing strength.

3.5.1 Geophysical Hazards

Colorado's earthquake hazard is similar to other states in the intermountain west region. It is less than in states like California, Nevada, Washington, and Oregon, but greater than many states in the central and eastern United States.

The level of seismicity in Colorado has been characterized as being low to moderate (Kirkham and Rogers 1981) due in part to the lack of adequate seismographic coverage in the state, and a number of sizable earthquakes have occurred in the historical and more recent record (Figure 3-2).



Note: Dates of significant earthquakes are included along with observed swarms. Earthquakes denoted by circles, color and size corresponds to magnitude. Cities shown as black squares.

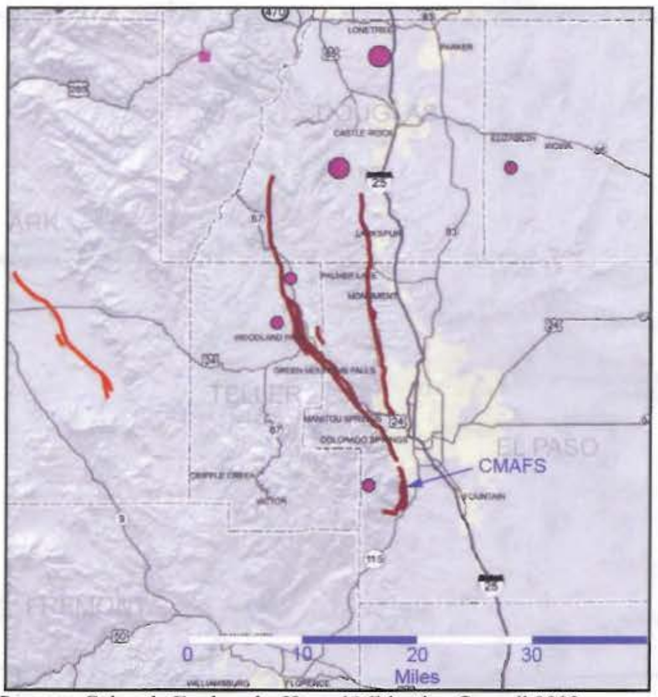
Figure 3-2

Seismicity of Colorado and Surrounding Areas, 1870-1992

The largest known historical earthquake in Colorado was the November 8, 1882 earthquake whose size (estimated Moment Magnitude 6.6 +/- 0.6 (Spence et al. 1996)) and location (somewhere in north-central Colorado) remain uncertain (McGuire *et. al.* 1982; Kirkham and Rogers 1986; Spence *et. al.* 1996). Perhaps the best known earthquakes in Colorado have been those induced by the disposal of waste fluids at the Rocky Mountain Arsenal near Denver (Evans, 1966; Healy et al. 1968; Herrmann, 1981) and secondary oil recovery in western Colorado at the Rangely oil field (Gibbs *et. al.* 1973). Earthquake swarms in Colorado are not uncommon (Bott and Wong 1995). A swarm of

earthquakes, including one of magnitude 4.6, occurred near Trinidad, Colorado in the fall of 2001 (Meremonte *et. al.* 2002). The largest instrumentally recorded natural earthquake in Colorado was a magnitude 5.5 earthquake in 1960 which occurred near Ridgeway in southwest Colorado (Talley and Cloud 1962). As noted above, earthquakes have occurred in geographic locations spread throughout the region.

Between 1962 and 2007 three earthquake epicenters (magnitude 3 to 3.9 [small purple circles]) occurred within 30 miles of CMAFS (Figure 3-3). A Colorado Earthquake and Fault map compiled by Matthew L. Morgan of the Colorado Geological Survey shows that there are known or suspected faults with displacement of late Quaternary deposits (approximately past 130,000 to 2 million years old [maroon lines] and approximately past 130,000 years[red lines]) within the region of interest.



Source: Colorado Earthquake Hazard Mitigation Council 2008

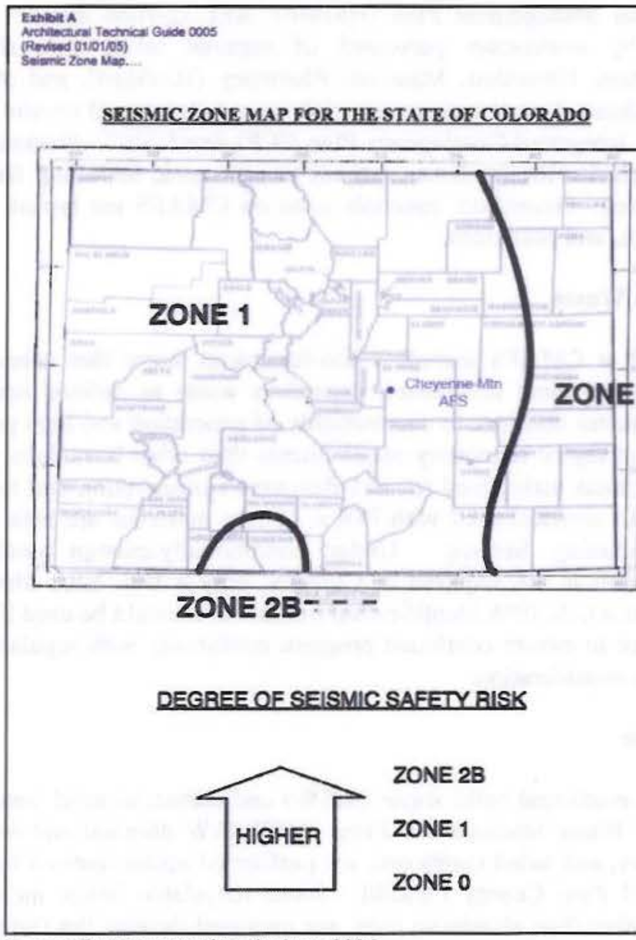
Figure 3-3

Known or Suspected Faults and Earthquakes within 25 miles of CMAFS

According to the Colorado Geological Survey, Colorado Division of Emergency Management, and the Colorado Earthquake Hazard Mitigation Council the largest recorded earthquake in Colorado (Category VII) resulted in the following type of reaction and damage:

Frightened all, ran outdoors. Rang large church bells. Damage negligible in buildings of good design and construction, slight in poorly built or badly designed buildings. Cracked chimneys to considerable extent, walls to some extent. Fall of plaster considerable. Shook down loosened brickwork and tiles. Broke weak chimneys. Dislodged bricks and stones.

It is prudent to expect future earthquakes as large as magnitude 6.6, the largest historical event in Colorado. Based on Colorado's historical earthquake record and geologic studies, an event as large as magnitude 6.5 to 7.25 could occur somewhere in the state. Scientists are unable to accurately predict when the next major earthquake will take place in Colorado; only that one will occur. Seismic zones for Colorado range from Zone 0 to Zone 2B, with the area around CMAFS being located in Zone 1 (Figure 3-4). According to the USDA State Architect actual ramifications to new construction in Colorado as a result of implementing Federal level regulations are probably negligible due to the relatively low seismic risk zone pattern for the State as well as the Stat of Colorado's requirement that more complex structures already be designed by a registered architect or engineer. By comparison, seismic zones in California are Zone 3 and Zone 4. Seismic safety provisions of the national model building codes (i.e. International Building Code 2003 [adopted by El Paso County]) are only intended to prevent fatalities and do not claim to prevent fatalities and do not claim to prevent property damage. This is due to the generally unpredictable nature of earthquake events and the economic unfeasibility of designing modern structures to prevent significant property damage (United States Department of Agriculture 2006).



Source: Department of Agriculture 2006

Figure 3-4

Seismic Zone Map for the State of Colorado

A Seismic Survey was conducted at CMAFS as part of a FEMA 178 Review in April 1978. In the summary of that report four potential earthquake-related hazards were assessed for the site; strong ground shaking, ground surface rupture, soil liquefaction, and slope failure. The report further stated that the facility is located in a low seismic active region of the United States. FEMA-178 indicates that the site coefficients for the seismicity are Aa=0.05 and Av=0.05. Similarly, the site falls within Seismic Zone 1 (Scale of 0 to 4) of the Uniform Building Code, where 4 is a high risk and 0 is no risk. Potential for soil amplification, liquefaction, and surface rupture were considered minimal for the site. For buildings located near the north entry, a moderate potential exists for rockfall from the granite outcroppings located above the site(CMAFS 1978).

3.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE/SOLID WASTE

3.6.1 Hazardous Materials

Hazardous material (Hazmat) inventories are maintained by each work center in accordance with the CMAFS Hazardous Material Management Plan (HMMP), AFI 32-7086 dated 1 August 2004. The HMMP specify the use by workcenter personnel of material safety data sheets, environmental management inventory system, Hazardous Materials Pharmacy (HazMart), and other related subjects. Emergency response procedures, hazard assessment, risk management, and on-site transportation issues are included in the CMAFS Integrated Contingency Plan (ICP) dated 2007. Workcenter-specific surveys have been conducted to address Hazmat issues present in each area, including flammable/combustible liquids and compressed gases. Hazardous materials used on CMAFS are typical petroleum, oils, and lubricants (POLs), herbicides, and pesticides.

3.6.2 Hazardous Waste

Hazardous waste generated at CMAFS include: non-hazardous waste that cannot be disposed of in landfills (such as used oil and spent antifreeze); hazardous waste as defined under federal and state regulations; and universal wastes that, due to commonality of generation and high potential for recycling, are subject to slightly less stringent regulatory requirements than other hazardous waste. Additionally, there are several collection areas maintained for non-Resource Conservation and Recovery Act (RCRA) regulated absorbent materials contaminated with POLs. These materials are also disposed through the Defense Reutilization Marketing Service. Under conditionally-exempt small-quantity generator (CESQG) status, a full permit is not required at CMAFS, only a U.S. EPA identification number is required. CMAFS maintains a U.S. EPA identification number that would be used if they were to lose the CESQG status. Surveillance to ensure continued program conformity with regulatory requirements and mission changes is the main consideration.

3.6.3 Solid Waste

The solid waste, including municipal solid waste (MSW) and industrial solid waste (ISW) is managed through the CMAFS Solid Waste Management Plan. MSW/ISW disposal and recycling of aluminum cans, bond paper, newspaper, and baled cardboard, are performed under contract by Waste Connections. Waste disposal is in the El Paso County Landfill. Some recyclable items, including computers and furniture, and scrap metal other than aluminum cans, are managed through the Defense Reutilization and Marketing Service (DRMS).

The recycling program includes materials for which a market exists in Colorado. The materials separated from MSW/ISW for recycling include:

- Metals (sorted into several categories per DRMS guidance) and aluminum cans;
- High quality paper; newspaper; cardboard (shipping boxes are baled for collection);
- Lead/acid batteries (most of which are returned to the supplier in lieu of core charges); and
- Used oil (picked up as a non-hazardous waste by DRMS).

Tires are turned in to tire suppliers in lieu of core charges by the personnel responsible for maintenance of the specific vehicle. Only brown glass, uncommon on-site, has a ready market in Colorado, and plastic does not have local market potential at this time. Additionally, laser printer and copier toner cartridges are turned in for recycling from all workcenters that use them. Bond paper and printer toner cartridges are found in virtually every workcenter. Spent fluorescent light tubes and non-lead/acid batteries, which are managed and disposed of through the Defense Reutilization Marketing Office (DRMO) as "universal waste", are also ultimately recycled.

Medical wastes generated by the Dental Clinic are disposed through a separate contract at Peterson AFB (PAFB).

3.7 LAND USE

Land use surrounding the CMAFS has grown significantly in the past decade. The parcel of land to the north-northeast (formerly part of the Star Ranch) has been subdivided into single-family residential housing. A portion of the land adjacent to the south-southeast (formerly the JL Ranch) has been designated as Cheyenne Mountain State Park. The park consists of 1,680 acres (680 hectares) and its ecology is similar to CMAFS. Commercial broadcast antennas are located to the west atop the summit of Cheyenne Mountain. A limited access road leading to the antenna farm is located north-northeast of the site. Lands to the west of the CMAFS boundary are managed by the United States Forest Service, Pike's Peak District of the Pike National Forest and consist of undeveloped mountain land. Fort Carson Army post is located to the east across State Highway 115.

3.8 NOISE

Sound travels through the air as waves of minute air pressures fluctuations caused by vibration. Sound level meters measure pressure fluctuations from sound waves, with separate measurements made for different sound frequency ranges. These measurements are reported in a logarithmic decibel (dB) scale. Because the human ear is not equally sensitive to all frequencies, the "A-weighted" decibel scale (dBA) is used to weight the meter's response to approximate that of the human ear. Average noise exposure over a 24-hour period often is presented as a day-night average noise level (Ldn). Ldn values are calculated from 24-hour averages in which nighttime values (10:00 PM to 7:00 AM) are increased 10 dB to account for the greater disturbance potential from nighttime noises.

Example noise levels include the following: military aircraft at 500 feet is 100 dB, a heavy truck at 50 feet is 80 dB, military aircraft at 10,000 feet is 70 dB, rural daytime outdoors is 40dB, and a bedroom at night is 40 dB. Relative to human receptors, noise levels under 40 dBA are considered quiet, 46 to 65 dBA are considered moderately loud, 66 to 75 dBA are considered loud, and 76 to 110 dBA are considered very loud and 111 dBA and above are considered uncomfortable. Sounds over 80 dB are considered dangerous. Land uses that are considered to be sensitive to noise are known as sensitive receptors. Sensitive receptors can include residences, schools, libraries, hospitals, and other land uses where people

general expect and need a quiet environment. There are no on-site sensitive receptors at CMAFS. Off-site sensitive receptors include the adjacent residential developments.

The federal Noise Control Act of 1972 (42 U.S.C. § 4901 *et seq.* [1994]) requires that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations. Local and state agencies have no applicable authority over military aircraft operations. The State of Colorado passed statute 25-12-103 on maximum permissible noise levels. It states that if sound levels of a noise are above the given limit when 25 feet away, than the noise is public nuisance. The established noise limits are in Table 3-7.

Table 3-7 Colorado Noise Limits

Zone	7:00 AM to 7:00 PM	7:00 PM to 7:00 AM
Residential	55 dBA	50 dBA
Commercial	60 dBA	55dBA
Light Industrial	70 dBA	65 dBA
Industry	80 dBA	75 dBA

"Residential" refers to an area where houses, apartments, etc are located. It may or may not include hotels/motels or limited office development, but does not include retail shops. "Commercial" refers to an area where offices, clinics, shopping centers, hotels/motels, gas stations, retail or commercial businesses are located. It could also mean a commercially dominated area where multiple-unit dwellings (i.e. apartments) are located. A "Light Industrial" area is one in which there are clean and quite research laboratories, warehouses, clean and quiet industrial activities, or where the general environment is free from concentrated industry. "Industrial" is an area where noise restrictions on industry are necessary to protect neighboring properties. The only zones near the boundary of CMAFS are residential.

The Air Installation Compatibility Use Zone/Land (AICUZ) is the DOD instruction on managing noise and flight safety for installations with airfields (DoD Instruction 4165.57 and AFI 32-7063). A helipad is located adjacent to NORAD Road and is used approximately 6 times a year. Other than the occasional use of this helipad, CMAFS does not conduct air operations on the installation; therefore, AICUZ is not applicable.

The most prevalent sources of noise at CMAFS include vehicle traffic and landscaping and maintenance equipment.

3.9 SOCIOECONOMICS

The area identified as the affected environment for socioeconomic analysis is both the City of Colorado Springs and El Paso County because most of the effects on the population and economy would occur in this area. Data for Colorado Springs is included because it is the largest city in El Paso County and the city nearest to CMAFS. Other nearby cities includes Manitou Springs to the north and Fountain to the east. Nearby counties include Teller (approximately 5 miles west), Fremont (approximately 9 miles southwest) and Pueblo (approximately 15 miles south). Data for the state of Colorado is presented for comparison. Socioeconomic resources include data on population, employment, income, housing and schools. Population includes the number of residents in the area and the recent change in population growth. Employment data includes labor sectors, labor force and statistics on unemployment. Income information is provided as an annual total by county and as per capita income. Housing information is

presented as total units, owner occupancy rate, and vacancy information. School enrollment and capacity are important considerations in assessing the effects of potential socioeconomic growth.

3.9.1 Population

The 2006 population of Colorado Springs was approximately 399,452, representing an increase of 14.8 percent over the 2000 population. By comparison, the population of El Paso County grew by approximately 13.6 and Colorado grew by 13.0 percent over the same 6 year period (Table 3-8). Colorado Springs had a population density of 2,147 persons per square mile in 2006. El Paso County had a population density of approximately 276 persons per square mile in 2006.

Table 3-8 Population for the Region of Interest

Region	2000	2006	Percent Change
City of Colorado Springs	360,890	399,452	14.8
El Paso County	516,929	587,272	13.6
State of Colorado	4,301,261	4,861,515	13.0

Source: U.S. Census Bureau 2000a, b, and c and 2006a, b, and c

3.9.2 Employment

Table 3-9 shows that Colorado Springs had a civilian labor force of approximately 213,248 people with approximately 12,410, or 5.8 percent, unemployed. The unemployment rate in Colorado Springs, El Paso County, and the state of Colorado has increased from 2000 to 2006. This increase was highest in El Paso County where the unemployment rate grew by 1.6 percent. In Colorado Springs and the state, the unemployment rate grew by 1.2 percent.

Table 3-9

Civilian Labor Force General Employment (2000, 2006)

Region	(2000/2006)	Employed (2000/2006)	Unemployed (2000/2006)	Unemployment Rate (2000/2006)
City of Colorado Springs	185,047/213,248	176,527/200,838	8,520/12,410	4.6/5.8
El Paso County	256,858/294,319	244,913/275,848	11,945/18,471	4.7/6.3
State of Colorado	2,304,454/2,574,211	2,205,194/2,432,651	99,260/141,560	4.3/5.5

Source: U.S. Census Bureau 2000a, b, and c, and 2006a, b, and c

Table 3-10 shows the breakdown of employment by industry sector in Colorado Springs, El Paso County, and the state of Colorado. The largest portion of the City, as well as the County and State, was employed in educational services and health care and social assistance. Professional, scientific, management, administrative, and waste management service are the second most common sources of employment. Retail trade is the third. Colorado Springs and El Paso County are similar in the percentage of the civilian work force in each sector. Less than one percentage point separates the two for each sector. More variation exists between the City and County and the State of Colorado, although they don't vary more

than two percentage points. A larger percentage of the population of Colorado Springs and El Paso County are employed by the Armed Forces than by the state. The armed services employed approximately 3.3 percent of the population of Colorado Springs and 6.9 percent of El Paso County. By comparison, less than 1 percent of the population of the State was employed in this sector. Although there are several military installations (Fort Carson, CMAFS, PAFB) in Colorado, the majority of the military infrastructure is located in El Paso County. CMAFS employs approximately 800 civilian and military personnel, which represents 4 percent of El Paso County residents.

Table 3-10 Industry (2006)

	City of Colorado Springs (% of Total)	El Paso County (% of Total)	State of Colorado (% of Total)
Agriculture, forestry, fishing, hunting, and mining	858 (0.4)	1,314 (0.5)	49,133 (2.0)
Construction	16,531(8.2)	22,842 (8.3)	244,324 (10.0)
Manufacturing	14,968 (7.5)	21,956 (8.0)	176,431 (7.3)
Wholesale trade	5,141 (2.6)	6,165 (2.2)	75,794 (3.1)
Retail trade	24,070 (12.0)	32,369 (11.7)	278,109 (11.4)
Transportation, warehousing, and utilities	7,301 (3.6)	12,278 (4.5)	112,093 (4.6)
Information	6,566 (3.3)	8,558 (3.1)	88,911 (3.7)
Finance and insurance, and real estate and rental and leasing	18,450 (9.2)	24,827 (9.0)	200,870 (8.3)
Professional, scientific, management, administrative, and waste management services	27,656 (13.8)	37,651 (13.6)	302,168 (12.4)
Educational services, health care, and social assistance	35,196 (17.5)	48,455 (17.6)	430,446 (17.7)
Arts, entertainment, recreation, accommodation, and food services	21,493 (10.7)	26,809 (9.7)	237,443 (9.8)
Other services, except public administration	11,506 (5.7)	16,070 (5.8)	122,491 (5.0)
Public administration	11,102 (5.5)	16,554 (6.0)	114,438 (4.7)
Civilian Labor Force Total	198,726 (100)	273,736 (100)	2,430,539 (100)
Armed Forces*	6,883 (3.3)	20,559 (6.9)	25,008 (0.01)

Source: U.S. Census Bureau 2006a, b, and c

Note: *Percentage of the Armed Forces based on civilian labor force total and armed forces total combined.

3.9.3 Income

Table 3-11 shows the total personal income and the per capita income for El Paso County and for the State of Colorado. Per capita income for El Paso County in 2006 was $34,189. This income level ranked as 22nd in the state out of 63 counties and was approximately 87 percent of the state average of $39,491. Between 2005 and 2006 per capita income grew by 3.2 percent, and over the ten year period between

from 1997 to 2006 it grew by 30.0 percent. The state average per capita income increased 4.8 percent from 2005 to 2006 and approximately 32.0 percent from 1997 to 2006. In 2006 El Paso County ranked 4th in the State in total personal income. Total personal income in El Paso County grew 5.4 percent between 2005 and 2006 and grew by 41.4 percent between 1997 and 2006. For the state of Colorado, total personal income grew 6.6 percent from 2005 to 2006 and 42.7 percent from 1997 to 2006.

Table 3-11

Total Personal Income and Per Capita Income,

El Paso County and State of Colorado

	Total Personal Income ($1,000s)		Per Capita Income ($)	
Year	*El Paso County*	*Colorado*	*El Paso County*	*Colorado*
1997	11,646,647	107,873,315	23,918	26,846
1998	12,887,952	118,492,917	25,876	28,784
1999	13,940,945	128,859,584	27,387	30,492
2000	15,373,444	144,393,687	29,595	33,361
2001	16,121,711	152,699,639	30,097	34,438
2002	16,299,408	153,066,193	29,907	33,956
2003	16,619,056	154,828,993	30,137	33,989
2004	17,540,888	163,736,180	31,360	35,523
2005	18,794,435	175,734,027	33,082	37,600
2006	19,862,031	188,221,719	34,189	39,491

Source: U.S. Bureau of Economic Analysis 2006

3.9.4 Housing

Table 3-12 shows the total housing units in the City, County and State for 2006. Colorado Springs had the lowest owner occupancy rate (64.4 percent) and the lowest owner vacancy rate (1 percent). The owner vacancy rate for Colorado Springs and El Paso County are lower than the State of Colorado. The median home values for the Colorado Springs ($204,900) and El Paso County ($208,200) are lower by approximately $30,000 than the State median home price ($232,900).

Table 3-12 Housing 2006

	City of Colorado Springs	El Paso County	State of Colorado
Total Units	174,676	239,752	2,095,235
Owner Occupancy Rate	64.4	68.7	68.7
Vacancy: Owner/Renter	1/11.8	1.5/11.8	2.7/8.4
Number Vacant	15,352	20,906	248,247

Source: U.S. Census Bureau 2006a, b, and c

3.9.5 Schools/Education

El Paso County has 15 school districts and Colorado Springs has 6 of those districts. School enrollment in 2006 for Colorado Springs was 73,497 (K-12) compared with 71,243 children enrolled in 2000. Table 3-13 shows the education attainment for the City of Colorado Springs, El Paso County, and the State of Colorado.

Table 3-13 Educational Attainment (2006)

	City of Colorado Springs (% of Total)	El Paso County (% of Total)	State of Colorado (% of Total)
Less than 9th grade	7,995 (3.1)	9,925 (2.7)	142,859 (4.6)
9th to 12th grade, no diploma	14,683 (5.6)	20,943 (5.7)	229,951 (7.4)
High School Graduate (include equivalency)	55,689 (21.4)	83,744 (22.7)	765,604 (24.5)
Some College, No Degree	65,182 (25.1)	91,450 (24.8)	672,932 (21.5)
Associate's Degree	24,225 (9.3)	35,685 (9.6)	235,974 (7.6)
Bachelor's Degree	59,116 (22.7)	81,389 (22.1)	685,736 (22.0)
Graduate or Professional Degree	33,302 (12.8)	45,722 (12.4)	385,444 (12.4)
Total Population Over 25 Years Old	258,077 (100)	366,743 (100)	3,116,385 (100)

Source: U.S. Census Bureau 2006a, b, and c

3.10 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to, "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories." Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are made; allowed to share in and not excluded from benefits of actions; and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment (EO 12898 and Department Regulation 5600-2). Tables 3-14 and 3-15 provide data on potential environmental justice populations in the area of CMAFS. Table 3-14 shows the race and ethnicity characteristics of the population of Colorado Springs. Black or African Americans formed the dominant racial minority in 2006, and the Hispanic or Latino group was the dominant ethnic minority. Low-income households can be subject to disproportionate environmental effects. Poverty statistics can provide a measure of the distribution and prevalence of low income levels.

Table 3-14

Total Population of Colorado Springs by Race/Ethnicity (2000, 2006)

Race/Ethnicity	2000	2006	Percent of Total (2000/2006)
White	291,095	314,025	80.6/78.6
Black or African American	23,677	27,273	6.6/6.8
Native American	3,175	3,766	0.9/0.9
Asian	10,179	11,063	2.8/2.8
Native Hawaiian and Other Pacific Islander	764	762	0.2/0.2

Table 3-14, Page 1 of 2

Table 3-14 (Continued)

Total Population of Colorado Springs by Race/Ethnicity (2000, 2006)

Race/Ethnicity	2000	2006	Percent of Total (2000/2006)
Hispanic or Latino*	43,330	56,489	12.0/14.1
Some Other Race	18,091	25,380	5.0/6.4
Two or More Races	13,909	17,183	3.9/4.3
Total	360,890	399,452	

Table 3-14, Page 2 of 2

Source: U.S. Census Bureau 2000a, 2006a

Note: *In combination with other races. The categorical figures/percentages may add up to more than 100 percent because individuals may report more than one race.

Table 3-15 provides poverty statistics for Colorado Springs, El Paso County, and the state of Colorado. The poverty rate for families, individual persons, and children under the age of 18 in Colorado Springs is slightly higher than for all of El Paso County and lower than for all of Colorado. Between 2000 and 2006 the rates of families, individuals, and children under the age of 18 living in poverty has risen in the city, county, and state. The largest jump between 2000 and 2006 occurred with the percentage of children that are living in poverty.

Table 3-15 Poverty Statistics (2000, 2006)

	City of Colorado Springs (percent)	El Paso County (percent)	State of Colorado (percent)
Families living in poverty	6.1/6.3	5.7/5.9	6.2/8.4
Population living in poverty	8.7/9.6	8.0/9.0	9.3/12
Children under 18 living in poverty	10.8/11.8	10.0/11.1	10.8/15.7

Source: U.S. Census Bureau 2000a, b, and c and 2006a, b, and c

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 Federal Register, 19885), states that each federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Environmental health risks and safety risks mean risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or to ingest. These risks are the most likely to be encountered in areas where children are most likely to be present, for example schools, playgrounds, day care facilities, and neighborhoods with high concentrations of children. While children may occasionally visit CMAFS, there is no housing there, and no children are there regularly. However, there may be families with children living in the housing community next to the northeast boundary of CMAFS.

3.11 UTILITIES/INFRASTRUCTURE

Infrastructure typically refers to the systems and physical structures that enable a population in a specified area to function. Components of the infrastructure at CMAFS include transportation and circulation (i.e., movement of vehicles), and utilities (communication lines, drinking water, electricity, natural gas, solid waste handling and wastewater). Transportation, circulation, communication lines, drinking water, electricity, natural gas, solid waste handling and wastewater would not be significantly affected by the Proposed Action or Action Alternatives. Therefore, this EA focuses on electricity and electrical power. Outside sources of electric power used by CMAFS are provided by WAPA and by CSU which also provides electrical power to the Colorado Springs metropolitan area. Colorado Springs Utilities has a mix of self-generated hydroelectric power (34-MW); purchased wind power (1-MW); and customer provided photovoltaic power (189 kilowatts in 2008, and approximately 400 kilowatts in 2009). Colorado Springs Utilities have purchased RECs and are in the process of purchasing 50 MW of electricity from wind generating sources. Colorado Springs Utilities has been able to meet their Renewable Energy requirement in 2008 with self-generated hydroelectric power.

WAPA is the preferred source during "peak" consumption times due to lower peak cost. From CSU, power is fed from the Bradley Power Plant, and from the Drake Power Plant, both by underground lines.

The production of power over time is measured in megawatt-hours (MWh) or kilowatt-hours (kWh) of energy. A kilowatt is one thousand watts. Production of power at the rate of 1 MW for 1 hour equals 1 MWh of energy. The rate of consumption of commercial electricity for CMAFS is approximately 2,555 megawatt hours per month (MWh/mo) to 2,717 MWh/mo as shown in Table 3-16.

CMAFS has six 1,750 kilowatt diesel generators for backup that would be used if electricity from WAPA and CSU were to fail.

Table 3-16 Electrical Power Consumption at CMAFS

Source	Units	2005	2006	2007	2008	2009
WAPA	MWh	5,569	5,505	5,510	5,510	5,495
CSU	MWh	25,778	27,051	27,096	27,224	27,631
Total	MWh	31,347	32,556	32,606	32,734	33,126
Monthly	MWh	2,612	2,713	2,717	2,728	2,761

Source: CMAFS 2009
Notes: CSU – Colorado Springs Utilities
MWh – megawatts hours
WAPA – Western Area Power Administration

3.12 VISUAL/AESTHETICS

Scenic resources are considered to be a critical natural resource along the Colorado Front Range. In 1995, El Paso County joined with Boulder, Douglas, Jefferson, and Larimer Counties to better understand and communicate the significance of the Front Range Mountain Backdrop (FRMB) and to cooperate in conserving lands within the FRMB. The northern portion of Cheyenne Mountain, south to the CMAFS boundary, including a small area of the extreme northern portion of the installation, is included in a "critical preservation candidate lands" designation. The El Paso County Parks Department also has identified Cheyenne Mountain as a "significant landmark." Cheyenne Mountain State Park was acquired

in part because of the "dramatic visual backdrop" of Cheyenne Mountain. The scenic resources at CMAFS are thus of obvious and significant importance, both locally and regionally.

3.13 WATER RESOURCES

Seasonal runoff occurs along the upper portion of NORAD Road, upslope from the South Portal Road. This runoff creates a small area where salt cedar (*Tamarisk* sp.) is present along the road margin. Another area has vegetation and moist soils that indicate a seep, but flowing water has not been observed. This area is to the east (down slope) of the northern portion of South Portal Road and west (upslope) of the Building 300 compound and the overflow parking area/alternate helipad. Surface drainage at CMAFS flows generally eastward along several unnamed, ephemeral stream channels. These seasonal flows for three intermittent drainages lead off-site to the watershed of Fountain Creek (but not directly into Fountain Creek, which is east of Fort Carson) and eventually to the Arkansas River. One of these drainages originates in a steep ravine next to the North Portal. These streams typically do not flow during parts of the winter and dry months. Spring water discharging from the interior storm drainage system under a National Pollutant Discharge Elimination System permit evaporates or is absorbed into the soil and does not appear to exit the CMAFS property. The nearest permanent water source is Rock Creek, approximately 2.5 miles (four kilometers) south of the CMAFS boundary. Water is diverted through curbs and gutters, beaver slides, and parking lot diversion ponds.

There are no surface water impoundments on CMAFS property; CMAFS is not located within the 100-year or 500-year floodplain.

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4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4.0 presents the environmental consequences of the Proposed Action and Alternatives for each resource area discussed in Chapter 3.0. To define the consequences, this chapter evaluated the project elements described in Chapter 2.0 against the affected environment identified in Chapter 3.0. Cumulative effects of the Proposed Action with other past, current, and foreseeable future actions are presented at the end of Chapter 4.0. The following assumptions we made to determine the environmental consequences:

- The project would take up to one year to complete.
- Up to 15 workers would be required for grading, digging, leveling, construction of concrete pads, fencing, battery storage building, and solar array panels.

4.1 AIR QUALITY

The ROI for air quality was defined as El Paso County, Colorado where the 1-MW solar array would be constructed and operated. To evaluate air emissions and their impact on the ROI, the emissions associated with the project activities were compared to total emissions on a pollutant by pollutant basis. Potential impacts to air quality would be identified as any pollutants that exceeds the *de minimus* threshold or permit threshold.

This project requires a Conformity Review because the project falls within the Colorado Springs Carbon Dioxide Maintenance Area. Estimated CO emissions from the Proposed Action would be well below the conformity *de minimus* threshold of 100 tons per year. Consequently, a Record of Non-applicability (RONA) has been prepared for the Proposed Action and is included in Appendix A.

4.1.1 Proposed Action

The air quality analysis focused on emissions associated with construction of the solar array, including the transportation-related emissions. Under the Proposed Action a 10.3 acre site adjacent to Norad Road would need to be prepared for installation of the solar panels. This would require clearing and grading the Site and involve the use large equipment such as bulldozers, loaders, backhoes, brush chippers, drill rigs, forklifts, and trenchers. In addition, powered hand tools, such as chain saws, would be required during the site preparation phase. Emissions from construction activities were estimated using a detailed spreadsheet model that evaluates multiple phases of construction activity and that accounts for federal emission standards applicable for non-road equipment. For purposes of this analysis, overall construction activity was divided into four phases: site preparation; trenching and installation of solar array footings, equipment pads, and construction of a storage building; installation of the solar array; and installation of security fencing. Emissions from construction worker traffic and construction-related truck traffic were estimated using vehicle emission rates from the MOBILE6.2 model. Table 4-1 summarizes criteria pollutant emissions from construction activity under the Proposed Action. Table 4-2 summarizes GHG emissions from this activity. Calculations are provided in Appendix A.

Calculated air emissions for El Paso County are shown in Table 4-3. Estimated construction activity emissions of criteria pollutants are less than one ton for any individual pollutant over the entire construction period. These emissions are a very small fraction of exiting CMAFS and El Paso County emissions. Estimated GHG emissions from criteria pollutants are numerically much larger than emissions of criteria pollutants. However, the emissions are extremely small, 0.00000075 percent of the estimated 129.7 million tons per year carbon dioxide equivalents (CO_2e), when compared to statewide GHG

emissions for Colorado in 2005 (CDPHE 2007). Although the impact of GHG resulting from the Proposed Action would be less than significant when compared to the mega-million tons of emissions created by other sources, it is still an issue of global concern. To help minimize these potential impacts on GHG, truck drivers and equipment operators would be instructed to limit truck idle times and the Contracting Officer would require the construction contractors have their engines optimized for fuel efficiency.

Table 4-1

Estimated Criteria Pollutant Emissions for Construction Activity–Proposed Action

Construction Phase	Construction Activity Emissions (tons)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Site Preparation	0.12	0.04	0.21	0.01	0.03	0.01
Trenching, Pads, and Building	0.02	0.11	0.26	0.02	0.02	0.01
Panel Array Installation	0.01	0.07	0.07	0.02	0.01	0.01
Fencing	0.002	0.02	0.01	0.003	0.01	0.002
On-Site Total	**0.16**	**0.24**	**0.56**	**0.04**	**0.07**	**0.03**
Vehicle Traffic	0.07	0.27	0.82	nd	nd	nd
Total	**0.23**	**0.51**	**1.38**	**0.04**	**0.07**	**0.03**

Notes:
CO – carbon monoxide
NO_x – nitrogen oxides
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
SO_2 – sulfur dioxide
VOC – volatile organic compounds

Table 4-2

Estimated Greenhouse Gas Emissions for Construction Activity–Proposed Action

Construction Phase	Construction Activity Emissions (tons)			
	Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalents (CO_2e)
Site Preparation	5.0	0.0002	0.0002	5.0
Trenching, Pads, and Building	15.2	0.001	0.001	15.3
Panel Array Installation	11.3	0.001	0.0004	11.4
Fencing	2.0	0.0001	0.0001	2.0
On-Site Total	**33.4**	**0.002**	**0001**	**33.8**
Vehicle Traffic	63.5	nd	nd	63.5
Total	**96.9**	**0.002**	**0.0001**	**97.3**

If land disturbance is less than one acre or less than six months in duration, then the project may be exempt from El Paso County or State of Colorado construction permit requirements. In March 2009 El Paso County eliminated its air quality program due to budget cuts and unstable funding (El Paso County Department of Health and Environment 2009). The Colorado Air Pollution Emission Notice (APEN) states that land development projects that are greater than or equal to 25 continuous acres and/or six months in duration would require a permit.

Consequently, construction permits from the State of Colorado would be required if the project period of performance is longer than six months.

Grading emissions would cause an increase in particulate matter emissions; however, these emissions would not exceed the 100 tons per year (tpy) *de minimus* threshold. Particulate matter emissions would be minimized by implementing dust control measures in accordance with best management practices. Carbon monoxide emissions would be expected to remain below the 100 tpy *de minimus* threshold.

Table 4-3

Emission Inventory for El Paso County (2007)

Category	Benzene	CO	NO_x	PM_{10}	SO_2	VOC
			(tons per year)			
Agriculture				108.58		
Aircraft	1.67	1,064.31	147.29	18.70	6.48	56.98
Biogenic	0.00	2,792.14	929.75	0.00	0.00	17,644.65
Commercial Cooking	2.67	70.69		185.49		24.72
Construction				10,745.36		
Forest and Prescribed Fire	4.50	1,315.00	51.66	131.53	8.44	59.78
Fuel Combustion	0.01	328.76	764.50	4.45	9.67	44.62
Highway Vehicles	171.88	90,269.87	9,628.58	230.09	73.09	6,098.37
Non-Road	76.21	36,802.20	2,729.85	250.42	82.24	2,317.15
Oil & Gas point	0.04	81.66	55.44	0.24	0.49	1.42
Other Point Sources	23.32	1,430.62	7,197.77	1,277.40	6,927.05	2,521.16
Railroads	0.09	83.98	836.34	20.89	44.23	36.10
Road Dust				4,058.03		
Solvent Utilization	33.12					1,429.12
Structure Fires		35.38	0.82	6.37		6.49
Surface Coating						1,008.85
Wood burning	181.17	28,301.36	301.71	4,002.98	61.88	8,649.20
Total	494.65	162,576.00	22,643.71	21,040.53	7,213.56	39,898.62

Source: Colorado Department of Public Health and Environment 2008

Notes:
CO – carbon monoxide
NO_x – nitrogen oxides
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
SO_2 – sulfur dioxide
VOC – volatile organic compounds

Emissions from mobile sources and fugitive sources would produce localized, short-term elevated air pollution concentrations which would not result in any long-term impacts on air quality in the Colorado Springs or El Paso County areas. The emissions of PM_{10} and CO created during clearing and grading activities would be temporary and are not expected to adversely affect air quality or visibility.

Once the solar arrays have been constructed, the land surrounding the arrays would require fugitive dust suppression measures until the disturbed areas have been stabilized by paving, landscaping, or other methods. Particulate matter emissions would be controlled by applying adequate amounts of water, chemical stabilization, or other effective dust suppression methods. With the use of dust suppressants and long-term plans to stabilize graded soils within and around the solar arrays, long-term adverse impacts on air quality would not be expected.

4.1.2 Alternative A

Impacts on air quality would be similar to the impacts identified for the Proposed Action if Alternative A is implemented. Although the total site acreage for Alternative A is only 0.2 acre smaller than the Proposed Action site, Alternative A would require more brush and tree clearing than the Proposed Action. As a result, emissions from Alternative A would be slightly higher than those for the Proposed Action. Table 4-4 summarizes criteria pollutant emissions from Alternative A. Table 4-5 summarizes GHG emissions from Alternative A. Impacts on air quality would last for the duration of the construction phase of the project; however, these impacts would be temporary and less than significant. Particulate matter emissions would be minimized through dust suppression methods.

Estimated GHG emissions from criteria pollutants are numerically much larger than emissions of criteria pollutants. However, the emissions are extremely small, 0.00000076 percent of the estimated 129.7 million tons per year CO_2e, when compared to statewide greenhouse gas emissions for Colorado in 2005 (CDPHE 2007). Although the impact of GHG resulting from the implementing Alternative A would also be less than significant when compared to the mega-million tons of emissions created by other sources, it is still an issue of global concern. To help minimize these potential impacts on green house gases, truck drivers and equipment operators would be instructed to limit truck idle times and the Contracting Officer would require the construction contractors have their engines optimized for fuel efficiency.

Calculations are provided in Appendix A.

Table 4-4

Estimated Criteria Pollutant Emissions for Construction Activity – Alternative A

Construction Phase	Construction Activity Emissions (tons)					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Site Preparation	0.14	0.05	0.25	0.01	0.03	0.01
Trenching, Pads, and Building	0.02	0.11	0.26	0.02	0.02	0.01
Panel Array Installation	0.01	0.07	0.07	0.02	0.01	0.01
Fencing	0.002	0.02	0.01	0.003	0.01	0.002
On-Site Total	**0.18**	**0.25**	**0.59**	**0.05**	**0.07**	**0.03**
Vehicle Traffic	0.07	0.28	0.83	nd	nd	nd
Total	**0.25**	**0.53**	**1.42**	**0.05**	**0.07**	**0.03**

Notes:
CO – carbon monoxide
NO_x – nitrogen oxides
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
SO_2 – sulfur dioxide
VOC – volatile organic compounds

Table 4-5

Estimated Greenhouse Gas Emissions for Construction Activity – Alternative A

Construction Phase	Construction Activity Emissions (tons)			
	Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalents (CO_2e)
Site Preparation	5.8	0.0002	0.0002	5.9
Trenching, Pads, and Building	15.2	0.001	0.001	15.3
Panel Array Installation	11.3	0.001	0.0004	11.4
Fencing	2.0	0.0001	0.0001	2.0
On-Site Total	**34.3**	**0.002**	**0001**	**34.7**
Vehicle Traffic	64.6	nd	nd	64.6
Total	**98.9**	**0.002**	**0.001**	**99.3**

4.1.3 Alternative B

Impacts on air quality would be similar to the impacts identified for the Proposed Action if Alternative B is implemented. Alternative B is approximately 7 acres larger than the Proposed Action and Alternative A sites. In addition, Alternative B has more brush and tree cover than the other sites. Consequently, emissions from Alternative B would be somewhat greater than those from the Proposed Action or

Alternative A sites. Table 4-6 summarizes criteria pollutant emissions from Alternative B. Table 4-7 summarizes GHG emissions from Alternative B. Impacts on air quality would last for the duration of the construction phase of the project; however, these impacts would be temporary and less than significant. Particulate matter emissions would be minimized through dust suppression methods.

Table 4-6

Estimated Criteria Pollutant Emissions for Construction Activity – Alternative B

Construction Phase	Emissions (tons) From Construction Activity					
	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Site Preparation	0.20	0.07	0.35	0.01	0.06	0.02
Trenching, Pads, and Building	0.02	0.11	0.26	0.02	0.02	0.01
Panel Array Installation	0.01	0.07	0.07	0.02	0.01	0.01
Fencing	0.003	0.02	0.01	0.003	0.01	0.003
On-Site Total	**0.24**	**0.27**	**0.70**	**0.05**	**0.10**	**0.04**
Vehicle Traffic	0.08	0.30	0.89	nd	nd	nd
Total	**0.32**	**0.57**	**1.59**	**0.05**	**0.10**	**0.04**

Notes:
CO – carbon monoxide
NO_x – nitrogen oxides
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
SO_2 – sulfur dioxide
VOC – volatile organic compounds

Table 4-7

Estimated Greenhouse Gas Emissions for Construction Activity – Alternative B

Construction Phase	Emissions (tons) From Construction Activity			
	Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalents (CO_2e)
Site Preparation	8.3	0.0004	0.0003	8.4
Trenching, Pads, and Building	15.2	0.001	0.001	15.3
Panel Array Installation	11.3	0.001	0.0004	11.4
Fencing	2.6	0.0001	0.0001	2.7
On-Site Total	**37.4**	**0.002**	**0001**	**37.8**
Vehicle Traffic	69.7	nd	nd	69.7
Total	**107.1**	**0.002**	**0.001**	**107.5**

Estimated GHG emissions from criteria pollutants are numerically much larger than emissions of criteria pollutants. However, the emissions are extremely small, 0.00000083 percent of the estimated 129.7 million tons per year CO_2e, when compared to statewide greenhouse gas emissions for Colorado in 2005 (CDPHE 2007).

Calculations are shown in Appendix A.

4.1.4 No-Action Alternative

If the No-Action Alternative is implemented, no new air emissions would be generated. Impacts on air quality would be less than significant and no mitigation measures would be required.

4.2 BIOLOGICAL RESOURCES

Federal agencies are required by Section 7 of the Endangered Species Act (ESA) to assess the effect of any project on federally-listed threatened and endangered species. Under Section 7, consultation with the USFWS is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. A conference is required if such action could directly or indirectly affect a proposed listed species or proposed critical habitat. It is Air Force policy to follow management goals and objectives specified in Integrated Natural Resources Management Plans (INRMP), and to consider special-status species, sensitive communities, and habitats recognized by state and local agencies when evaluating impacts of a project.

Impacts on biological resources would be considered significant if special-status species or their habitats, as designated by federal, state, or local agencies, were affected directly or indirectly by project-related activities. In addition, impacts to biological resources would be considered significant if substantial loss, reduction, degradation, disturbance, or fragmentation occurred in native species habitats or in their populations. These could be short- or long-term impacts; for example, short-term or temporary impacts may occur during project implementation, and long-term impacts may result from loss of vegetation and thereby loss of the capacity of habitats to support wildlife populations.

4.2.1 Proposed Action

If the Proposed Action is implemented, biological resources would be expected to experience less than significant short-term impacts during the grading and construction of the solar arrays and minor long-term adverse impacts resulting from loss of suitable habitat for foraging. Mitigation measures would be implemented as described in Section 4.2.5.

4.2.1.1 Vegetation

Implementing the Proposed Action would result in the removal of up to 10.3 acres of sparsely populated Oak-Pine woodlands and Oak Scrub (Figure 4-1). Several individuals of a plant species could be lost during the clearing and grading of the Site; however, it is unlikely that an entire plant species would be lost because of the distribution of the species in other locations on CMAFS and El Paso County. Removing vegetation would result in loss of habitat, a long-term adverse impact. However, because this Site is located adjacent to other buildings and parking areas on CMAFS, and no threatened, endangered, or species of special concern are known to be located within the 10.3 acres, removal of the vegetation would be unlikely to result in a significant adverse impact on biological resources.

Five of the seven known invasive plant species listed in Section 3.2.1.5 are located on or adjacent to the Proposed Action Site (CMAFS 2005). To prevent the spreading of these invasive plant species mitigation measures identified in the Invasive Plant Species Control Plan (CMAFS 2005). Specific control measures include requiring contractors to clean equipment and vehicles with high pressure air or water prior to use in the project area and before leaving unavoidable infestation zones in the construction areas. Cleaning should concentrate on the undercarriage, axles, frames, cross members, on and under steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs should be swept and refuse disposed of in waste receptacles. Care should be taken that wash water be retained on-site to prevent invasive plant material transport.

Figure 4-1

Vegetation at the Proposed Action Site

Additionally the contractor would be required to use certified invasive weed-free imported materials (e.g., straw bales, fill material, and erosion control seed) when and where needed during construction, reclamation, maintenance, and operations.

4.2.1.2 Wildlife

Implementation of the Proposed Action would likely result in short-term, temporary impacts on common wildlife species expected to be in the local area as identified in Section 3.2. Several individuals of a wildlife species could be lost during the clearing and grading of the Site due to crushing, digging, or burial; however, it is unlikely that an entire wildlife species would be lost because of the limited activities and distribution of the species in other locations. Increased soil erosion in adjacent habitats may also result in a loss of individuals. Construction noise and disturbance may also result in the abandonment of any breeding and/or roosting sites that could potentially occur in the trees or rock outcroppings and the disruption of foraging or roosting activities. These impacts may occur within the Site as well as within adjacent habitats. These impacts would be localized, and due to the abundance of surrounding habitat, most wildlife species would likely move to suitable habitats that are out of the area of disturbance. Additional fencing at the Site might create a barrier to wildlife movement, causing a short-term

population displacement or alteration of population distribution. Because of the location of the Proposed Action Site, inside the curve of Norad Road and adjacent to buildings and parking areas, it is unlikely that wildlife would migrate or forage in this area on a regular basis. Consequently, while the potential exists, the impacts on wildlife are not expected to be significant.

4.2.1.3 Special Status Species

Implementing the Proposed Action would not be expected to significantly affect any special status species that might occur at CMAFS.

Federal and State-Listed Threatened and Endangered Species

No federally listed threatened or endangered species are known to occur on CMAFS; therefore, there would be no effects on these species. Although suitable habitat for the federally and state-listed Mexican Spotted Owl exists on CMAFS, the available habitat is not critical habitat and the presence of this species has not been documented at CMAFS (Engineering and Environment 2005). According to 50 CFR Part 17.95(b) critical habitat exists adjacent to CMAFS; however, the removal of the sparse vegetation from the Proposed Action site would not be considered primary constituent elements related to forest structure or primary constituent elements related to maintenance of adequate prey species. CMAFS will conduct a Mexican Spotted-Owl study in 2010 prior to any construction on the solar array to verify that the species would not be located on the Proposed Action or Alternative Action sites.

The only other state-listed threatened or endangered species with habitat near CMAFS are the Bald Eagle and Burrowing Owl. Suitable Bald Eagle habitat is within 5 miles of CMAFS and suitable Burrowing Owl habitat would include grasslands on and in the vicinity of CMAFS. However, like the Mexican Spotted Owl, no Bald Eagles or Burrowing Owls have been observed at CMAFS; therefore, no effects on state-listed threatened or endangered species would likely occur from the Proposed Action.

State-Listed Species of Concern and Rare and Sensitive Species

As shown on Table 3-5 and 3-6 there are several state-listed species of concern and rare and sensitive species with suitable habitat on or in the vicinity of CMAFS. Only the peregrine falcon, golden eagle, prairie falcon, and Virginia's warbler have been previously observed at CMAFS. Clearing and grading the Proposed Action Site would remove habitat that could be used by these species; however, the habitat is not identified as critical habitat and the species are likely to move to other nearby habitat. Construction activities may also result in abandonment of any breeding and/or roosting sites that could potentially occur in the trees, rock outcroppings, or grasslands, or disrupt foraging activities.

CMAFS would maintain awareness of the presence of state-listed species of concern and rare and sensitive species and determine whether the management of listed species would mutually benefit these species as required by the INRMP.

4.2.2 Alternative A

Under Alternative A, impacts on biological resources would be similar to the impacts identified for the Proposed Action. No significant impacts would be expected. Mitigation and minimization measures would be implemented as described in Section 4.2.5.

4.2.2.1 Vegetation

Implementing Alternative A would result in the removal of up to 10.1 acres of Oak Scrub and Oak-Pine woodlands (Figure 4-2). The vegetation is primarily Oak Scrub with stands averaging 6 to 10 feet in height. Although the Alternative A Site is smaller than the Proposed Action Site, more vegetation and habitat would be removed if this Alternative were implemented. Removing vegetation would result in loss of habitat, a long-term adverse impact. However, because this Site is located adjacent to privately-owned family housing at Broadmoor Bluffs and segregated from other habitat by Norad Road, and because no threatened, endangered, or species of special concern are known to be located within the 10.1 acres, removal of the vegetation would be unlikely to result in a significant adverse impact on biological resources.

Figure 4-2

Vegetation at the Alternative A Site

Like the Proposed Action Site, five of the seven known invasive plant species listed in Section 3.2.1.5 are located on or adjacent to the Proposed Action Site (CMAFS 2005). To prevent the spreading of these invasive plant species mitigation measures identified in the Invasive Plant Species Control Plan (CMAFS 2005) would be implemented.

4.2.2.2 Wildlife

Impacts on wildlife would be similar to the impacts identified for the Proposed Action if Alternative A were implemented. Because of the location of the Alternative A Site, inside the curve of Norad Road and adjacent to privately-owned family housing at Broadmoor Bluffs, it is unlikely that wildlife would migrate or forage in this area on a regular basis. Consequently, while the potential exists, the impacts on wildlife are not expected to be significant.

4.2.2.3 Special Status Species

Impacts on special status species would be the same for Alternative A as identified for the Proposed Action. No significant impacts would be expected.

4.2.3 Alternative B

Under Alternative B, impacts on biological resources would be similar to the impacts identified for the Proposed Action. No significant impacts would be expected. Mitigation and minimization measures would be implemented as described in Section 4.2.5.

4.2.3.1 Vegetation

Implementing Alternative B would result in the removal up to 17.2 acres of Oak Scrub, Oak-Pine woodlands, and Pine Woodlands (Figure 4-3). The vegetation is primarily Oak Scrub with sparse stands averaging 6 to 10 feet in height. Less than 2.5 acres of Pine Woodlands would be removed. Removing vegetation would result in loss of habitat, a long-term adverse impact. Because no threatened, endangered, or species of special concern are known to be located within the 17.2 acres, removal of the vegetation would be unlikely to result in a significant adverse impact on biological resources.

Figure 4-3

Vegetation at the Alternative B Site

Like the Proposed Action and Alternative A sites, five of the seven known invasive plant species listed in Section 3.2.1.5 are located on or adjacent to the Alternative B Site (CMAFS 2005). To prevent the spreading of these invasive plant species mitigation measures identified in the Invasive Plant Species Control Plan (CMAFS 2005) would be implemented.

4.2.3.2 Wildlife

Impacts on wildlife would be similar to the impacts identified for the Proposed Action if Alternative B were implemented. Because the Alternative B Site is located away from previously disturbed areas, buildings, parking areas, roads, and privately-owned family housing areas at Broadmoor Bluffs, wildlife is more likely to migrate, forage, or be found at this Site. Construction noise and disturbance may also result in abandonment of any breeding and/or roosting sites that could potentially occur in the trees or rock outcroppings, or disrupt foraging activities. These impacts may occur within the Site as well as within adjacent habitats. The installation of fencing at the Site would create a barrier to wildlife movement and could cause a short- term population displacement or alteration of population distribution. These impacts would be localized, and due to the abundance of surrounding habitat, most wildlife species would likely move to suitable habitats that are out of the area of disturbance. Consequently, while potential impacts exist, the impacts on wildlife are not expected to be significant because of the abundance of similar habitat.

4.2.3.3 Special Status Species

Impacts on special status species would be the same for Alternative B as identified for the Proposed Action. No significant impacts would be expected.

4.2.4 No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on biological resources would occur. Impacts on biological resources would be less than significant and no additional mitigation or minimization measures would be required.

4.2.5 Significance/ Minimization Measures

Although no significant impacts are expected, CMAFS will implement minimization measures to reduce the potential for any adverse impacts resulting from the Proposed Action or Alternatives. This will include use of control measures to prevent the spread of invasive plant species and monitoring the selected Site during clearing and grading activities for threatened or endangered species that might migrate through the area.

4.3 CLIMATE

Implementing the Proposed Action or any of the Alternatives would not impact climate in the region. Climate could impact clearing, grading, construction, and operation of the solar array. These impacts would be seasonal. Rain or snow could delay activities; however, the delays would be expected to be temporary. Minimization measures to reduce any impact resulting from runoff of rain and snow melt are addressed in Section 4.5.

4.4 CULTURAL RESOURCES

4.4.1 Proposed Action

The Proposed Action would have no impact on cultural resources at CMAFS because no prehistoric or historic sites, sacred sites, or traditional cultural properties have been identified at CMAFS. Additionally, the Proposed Action would not have any effect on any landscapes that have cultural significance to any Native American tribes. Cultural resources are managed under the Integrated Cultural Resources Management Plan. Although there are no cultural sites, traditional cultural properties, or Native American landscapes that would potentially be affected, consultation with the State Historic Property Office under Section 106 will be required. Copies of this EA will be distributed to the Native American tribal representatives responsible for the Colorado Springs area. No additional mitigation measures would be needed.

4.4.2 Alternative A

Impacts on cultural resources would be the same for Alternative A as identified for the Proposed Action. Since there would be no impacts, no mitigation would be required.

4.4.3 Alternative B

Impacts on cultural resources would be the same for Alternative B as identified for the Proposed Action. Since there would be no impacts, no mitigation would be required.

4.4.4 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on cultural resources would occur. Impacts on cultural resources would be less than significant and no new mitigation or minimization measures would be required.

4.4.5 Significance/ Minimization Measures

Since there are no impacts expected, no mitigation or minimization measures would be required.

4.5 GEOLOGY AND SOILS

A project may result in significant geologic impact if it increases the likelihood of or results in exposure to earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. It also may be considered a significant geologic impact if it results in loss of aesthetic value from a unique landform, loss of mineral resources, substantially affects the contaminant distribution and fate and transport of soils, or results in severe erosion or sedimentation.

4.5.1 Proposed Action

The Proposed Action would have no long-term adverse effects on geology and soils at CMAFS because the area cleared and graded would be stabilized with compacted fill to provide the base for construction of the solar array. Due to the sandy loamy soils and steep topography at CMAFS, short-term impacts resulting from erosion could occur because of the water runoff occurring during and after rain and snow melt events. Removing trees, bushes, and grasses during construction could also cause or accelerate

surface erosion. Mitigation measures described in Section 4.5.5 would be implemented to limit these potential short-term adverse impacts.

4.5.1.1 Geological Hazards

CMAFS is located in an area of low seismic activity; consequently, the potential for effects from earthquakes would be assumed to be low. Since earthquakes could occur it would be prudent to design the solar array as necessary to ensure the construction meets International Building Codes 2003 standards. The solar panels would be bolted to concrete pads that would minimize movement during any seismic event. Consequently, the potential impact from geological hazards would be considered less than significant. Mitigation measures described in Section 4.5.5 would be implemented to limit the potential impacts that may occur as a result of seismic events.

4.5.2 Alternative A

The potential impacts on geology and soils would be similar if Alternative A were implemented instead of the Proposed Action. Mitigation measures described in Section 4.5.5 would be implemented to limit these potential short-term adverse impacts.

4.5.3 Alternative B

The potential impacts on geology and soils would be similar if Alternative B were implemented instead of the Proposed Action or Alternative A. The Ute Pass fault passes north to south through the Alternative B Site. Mitigation measures described in Section 4.5.5 would be implemented to limit these potential short-term adverse impacts.

4.5.4 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on geology and soils would occur. Impacts on geology and soils would be less than significant and no additional mitigation or minimization measures would be required.

4.5.5 Significance/Mitigation Measures

Design goals will be established that will include the following. The construction will conform to local building codes providing "Life Safety," meaning that the building may collapse eventually but not during an earthquake, the building will be designed for repairable structural damage, required evacuation of the building, and acceptable loss of business for stipulated number of days. The array will be designed for repairable nonstructural damage, partial or full evacuation, and acceptable loss of business for stipulated number of days due to repair.

To prevent any negative effects from project activities, CMAFS would implement State of Colorado best management practices to limit soil movement, stabilize runoff, and control sedimentation. Provisions would be included in the CMAFS Operations and Maintenance Contract to plant grasses, wildflowers, and indigenous vegetation, as well as place boulders and rock lining along the drainage swales along each side of Norad Road. Runoff would be diverted into these drainage swales.

4.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE/SOLID WASTE

4.6.1 Proposed Action

4.6.1.1 Hazardous Materials and Hazardous Waste

Construction of the solar array may require the use of hazardous materials by contractor personnel. Project contractors would comply with federal, state, and local environmental laws and would employ affirmative procurement practices when economically and technically feasible. All hazardous materials and construction debris generated by the construction would be handled, stored, and disposed of in accordance with federal, state, and local regulations and laws. Permits for handling and disposal of hazardous materials would be the responsibility of the contractor conducting the work.

In the event of a fuel spill during construction, the contractor would be responsible for its containment, clean up, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event of a contractor related release, the contractor would contact the Environmental Coordinator, MSG/CEAN and take appropriate actions to correct its cause and prevent future occurrences.

4.6.1.2 Solid Waste

Construction of the proposed solar array would generate minimal quantities of solid wastes. The construction comprises ground disturbance and digging for concrete footings, transmission lines, and fencing. Concrete footings would be installed and solar panels would be assembled. Solid wastes that would be generated may include concrete, scrap wire, and packing materials. Contractors would be directed to recycle materials to the maximum extent possible, thereby reducing the amount of debris disposed of in landfills. Materials not suitable for recycling would be taken to a landfill permitted to handle construction debris wastes. The proper management and recycling or disposal of construction debris would be the responsibility of construction contractors. The amount of waste generated by the Proposed Action would not have a significant impact to the operating life of the landfill. No environmental impacts to solid waste management would be expected from implementation of the Proposed Action.

4.6.2 Alternative A

Impacts on hazardous materials, hazardous waste, and solid waste would be similar if Alternative A were implemented instead of the Proposed Action. No significant impacts would be expected and no mitigation measures would be required.

4.6.3 Alternative B

Impacts on hazardous materials, hazardous waste, and solid waste would be similar if Alternative B were implemented instead of the Proposed Action or Alternative A. No significant impacts would be expected; no mitigation measures would be required.

4.6.4 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on hazardous materials, hazardous waste, or solid waste would occur. Impacts on hazardous materials, hazardous waste, or solid waste would be less than significant. Therefore, no mitigation measures would be required.

4.7 LAND USE

4.7.1 Proposed Action

Implementing the Proposed Action would be compatible with both current and planned land use. Land use associated with the project location site would be converted from open space and future facility development to light industrial use. El Paso County classifies the area for military use. Since there would be no change in ownership and land use would be consistent with the CMAFS General Plan, no significant impacts on land use would be expected to occur if the Proposed Action were implemented. No mitigation measures would be required.

4.7.2 Alternative A

Implementing the Alternative A would also be compatible with both current and planned land use. Land use associated with the project location site would be converted from open space to light industrial. A helicopter pad would be adjacent to the Alternative B Site. A letter from the Division of Aeronautics, California Department of Transportation to the California Energy Commission indicated that no unusual turbulence or thermal plume occurred during test flights flying at 200 to 300 feet above solar arrays. The reflectivity was sharper and cleaner than flying over a smooth water surface; however, the flash and distraction level appeared to be the same for four different observers in two separate aircraft. It was indicated that a Notice of Proposed Construction or Alteration (Form 7460-1) would need to be submitted to the Federal Aviation Administration (FAA) prior to beginning construction.

4.7.3 Alternative B

Implementing Alternative B would be compatible with both current and planned land use. Land use associated with the project location site would be converted from open space and light industrial use to light industrial use. El Paso County classifies the area for military use. Since there would be no change in ownership and land use would be consistent with the CMAFS General Plan, no significant impacts on land use would be expected to occur if the Proposed Action were implemented. No mitigation measures would be required.

4.7.4 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on land use would occur. Impacts on land use would be less than significant and no additional mitigation or minimization measures would be required.

4.7.5 Significance/Mitigation Measures

If Alternative A is selected for implementation CMAFS will submit a request for a Notice of Proposed Construction or Alteration (Form 7460-1) to the FAA before any actions are initiated. Because of the limited use of the helipad (less than once per month) and availability of an alternative helicopter landing site, the impact on land use would be less than significant. There would be no change in the land use

classification if the Proposed Action or any of the Alternatives are implemented; consequently, no additional mitigation would be needed.

4.8 NOISE

4.8.1 Proposed Action

Two types of noise would be expected to occur as a result of the construction and operation of a solar array at CMAFS; construction noise and transformer noise.

Construction work would cause an increase in sound above normal ambient noise levels. Noise would emanate from trucks, excavators, bulldozers, chain saws, augers, brush chippers, welders, saws, trenchers, and other pieces of equipment that would be used to clear, grade, and prepare the ground surface and during installation of the solar panels. Most construction equipment usually exceeds the ambient noise level by 20 to 25 A-weighted decibels (dBA) in urban areas and 30 to 35 dBA in suburban areas. Construction at the Proposed Action Site would likely result in temporary noise impacts for the housing areas located northeast of the Site. Noise generation would last only for the duration of construction activities and would be isolated to normal working hours (between 7:00 AM and 5:00 PM). Because the Proposed Action Site has a sparse covering of vegetation and is fairly flat, the use of heavy equipment would be estimated to last for less than 2 months. Predicted noise levels for construction equipment are shown in Table 4-8. The State of Colorado has established permissible noise levels for residential, commercial, light industrial and industrial areas, as shown in Table 4-9. The city of Colorado Springs has adopted these same permissible noise levels.

Short-term increases in noise levels would characterize the clearing and construction phase of the project. Based on the Inverse Square Law of Noise Propagation (Harris 1991) noise levels would be reduced by 6 dBA as the source distance is doubled (e.g., at 50 feet -6 dBA, 100 feet -12 dBA, at 200 feet -18 dBA, at 400 feet -24dBA, and at 800 feet -30 dBA). Average construction site noise level of 67 dBA at 400 feet (Table 4-8) would be expected and construction noise would equal approximately 59 dBA at 1,000 feet. At 1,000 feet, noise levels would approximate those of an active commercial area (United States Department of Interior 2009).

Table 4-8
Noise Levels Associated with Typical Construction Equipment

	Noise Level (dBA)					
Equipment	***At Site***	***50 feet[1]***	***100 feet***	***200 feet***	***400 feet***	***800 feet***
Average Construction Site	91	85	79	73	67	61
Auger Drill Rig	91	85	76	70	64	58
Backhoe	86	80	74	68	62	56
Chain Saw	91	85	79	73	67	61
Compressor (Air)	86	80	74	68	62	56
Crane	91	85	79	73	67	61
Dozer	91	85	79	73	67	61
Dump Truck	90	84	78	76	70	64
Grader	91	85	79	73	67	61
Rock Drill	91	85	79	73	67	61

Source: Department of Transportation, Federal Highway Administration 2009

Table 4-9

Permissible Noise Levels for Colorado

Zone	7:00 AM to 7:00 PM	7:00 PM to 7:00 AM
	dBA	
Residential	55	50
Commercial	60	55
Light industrial	70	65
Industrial	80	75

Source: CMAFS 2009

The noise ordnance for Colorado Springs states that construction projects shall be limited to the maximum permissible noise levels specified in the industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority, or if no time limitation is imposed, then for a reasonable period of time for completion of the project (Colorado Springs Ordnance 96-41 and 01-42).

Although CMAFS is not located within the city of Colorado Springs, residential areas that are within the incorporated area are adjacent to the base and would be affected by the noise created during project activities. The eastern edge of the Proposed Action Site is approximately 450 feet from the closest residential area that backs up to Norad Road. At that distance noise levels would be less than or equal to the permissible industrial limits for 7 AM to 7 PM or 7 PM to 7 AM as shown in Table 4-9.

Noise impacts from vehicles transporting workers and equipment would not be expected to be significant. Access to CMAFS via Colorado Highway 115 is restricted to authorized traffic (Figure 4-4). It is estimated that 6 additional vehicles would transport work crews of up to 10 workers to the Site each morning. Heavy equipment required for the project would be mobilized on Site and demobilized via Norad Road once it is no longer needed on site. Noise impacts resulting from adding less than a dozen vehicles per day would not be expected to create a significant impact on noise on the area.

Figure 4-4

Restricted Access to CMAFS via Norad Road

Transformers are designed for the transmission and distribution of electrical power. Apart from satisfying this functional performance objective, the operation of a transformer may induce annoying acoustic radiation. Transformer acoustic noise is a hum characterized by spectral spikes at harmonics of the fundamental frequency (100 Hertz [Hz] /120 Hz) which is twice the line supply frequency. The transformer's low frequency tonal noise components would be the major source of annoyance and intrusion, potentially invoking noise complaints from nearby residents.

Transformers typically generate a noise level ranging from 60 to 80 dBA. Transformer noise will "transmit" and attenuate at different rates depending on the transformer size, voltage rating, and design. Few complaints from nearby residents are typically received concerning substations with transformers of less than 10 megavolt amperes (MVA) capacity, except in urban areas with little or no buffers. Complaints are more common at substations with transformers sizes of 20 to 150 MVA, especially within the first 500 to 600 feet (McDonald 2003). At 80 dBA the noise would be attenuated to less than 55 dBA at the closest residence without any mitigation (i.e., equipment placement, barriers or walls). Since the transformer would be expected to be a 15 kilovolts amperes (kVA) input with a capacity of 34.5 kVA (same as current WAPA and CSU source), but still a hundred times smaller that the 10 MVA transformer that does not typically impact residents, it is unlikely the transformer noise would be significant.

4.8.2 Alternative A

The noise levels generated at the Site during clearing and construction activities would be the same as for the Proposed Action Site. The Alternative A Site would be located approximately 100 feet from the nearest residence. The average noise level at 100 feet from the Alternative A Site would be below the industrial standard used for daytime construction projects, but would be above nighttime permissible limits. Consequently, Site clearing and construction activities would be limited to 7 AM to 7 PM if Alternative A were implemented. Road noise levels from worker commute and equipment mobilization and demobilization would be the same as identified for the Proposed Action and no additional mitigation measures would be required. Transformer noise would be the same as describe for the Proposed Action; however, because the closest home is 100 feet from Alternative A Site transformer noise could be heard. Consequently, mitigation measures would be implemented to reduce the potential noise below 50 dBA, a less than significant noise level for residential areas at night

4.8.3 Alternative B

The noise levels generated at the Site during clearing and construction activities would be the same as for the Proposed Action Site. The Alternative B Site would be located over 3,500 feet from the nearest residence. The average noise level at 3,500 feet from the Alternative B Site would be well below the industrial standards used for daytime or nighttime construction projects; and below the noise level produced by any of the equipment used on the project. Because the noise resulting from clearing, construction, and traffic would be less than significant, no mitigation measures would be required during this phase of the project. Transformer noise would not be expected to be heard once the solar array is operational because of the distance from any potential receptors. Noise levels would be expected to be below 38 dBA at 3,500 feet from the closest residence.

4.8.4 No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on noise would occur. Impacts on noise would be less than significant and no additional mitigation or minimization measures would be required.

4.8.5 Significance/Mitigation Measures

The following mitigation measures would be implemented to ensure noise resulting from the construction and operation of the solar array would not result in a significant impact on the human or natural environment. Site preparation and construction activities would be limited to normal working hours of 7 AM to 7 PM. The transformer and uninterrupted power supply (UPS) building will be located at least 500 feet from the closest residence. Properly constructed sound barriers can provide several decibels of reduction in the noise level. An effective barrier involves a proper application of basic physics of transmission loss through masses, sound diffraction around obstacles, standing waves behind reflectors, and adsorption at surfaces. A sound barrier made of vegetation or concrete block would be installed around the building, if necessary to attenuate the sound emanating from the building.

4.9 SOCIOECONOMICS

4.9.1 Proposed Action, Alternative A, or Alternative B

Under the Proposed Action, Alternative A, or Alternative B the potential impacts on socioeconomics would be the same. Potential socioeconomic effects were assessed in terms of direct effects that would

be created during preparation and construction of the Site and indirect effects that would result from the operation of the Site.

The construction of the solar array would provide a short-term beneficial impact on socioeconomics. Construction activities would generate 13 jobs during the construction activities, 11 jobs in support of equipment and supply chain activities, and 12 jobs from induced impacts. Annual on-site labor impacts would result in 3 jobs for maintenance of the solar array and 2 to 3 jobs through local revenue and supply chain impacts and induced impacts. Total construction costs for labor and materials would be approximately $1.3 million and the annual operating costs are estimated at $238,219 (National Renewable Energy Laboratory 2009). Based on the employment in El Paso County and City of Colorado Springs adding 13 jobs would be an increase of less than 0.1 percent, a less than significant number. Since the workforce would be expected to come from the local Colorado Springs area, impacts on housing, schools and the local population would not be expected to be significant. No mitigation measures would be required.

4.9.2 No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on socioeconomics would occur. Impacts on socioeconomics would be less than significant and no mitigation or minimization measures would be required.

4.10 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

Implementing the Proposed Action or Alternatives would result in adverse environmental effects if any of the following criteria was identified:

- Significant impacts on employment, income, and population; or
- Pose potentially substantial harm to the safety of children during construction activities.

4.10.1 Proposed Action, Alternative A, and Alternative B

Environmental Justice addresses the disproportionately high and adverse human health or environmental effects on minority and low-income populations. Determination of disproportionately high and adverse human health effects are established by identifying the impact on the natural or physical environment and influence on minority and low-income populations. The construction and subsequent operation of the solar array would not create any significant adverse impacts on human health because construction activities would be limited to sites located on the base where minority or low-income populations are not present, and therefore, would not be affected. Access to the base is restricted to authorized personnel. The construction areas would be restricted to effectively bar any person, including children, from unauthorized access. To minimize any potential for human health effect that might result from using any hazardous materials, Hazmat would be managed per State of Colorado best management practices and Air Force pollution prevention guidelines. The completed solar array would have a fence surrounding the area as a safeguard to prevent unauthorized access. Implementing the Proposed Action or Alternatives would not displace any low-income or minority populations; consequently, no significant impact on environmental justice would be expected and no mitigation would be required.

The Proposed Action and Alternative Action Sites are within the boundaries of a restricted access military facility where children are not typically present except at scheduled events at Mountain Man Park or the

use of the playground, picnic pavilion, and outside volleyball courts. There are no housing areas within the fenceline of the base. Because the Site is approximately 2 miles from the nearest public highway, it is unlikely that children would have any reason to visit the Site, except as the children of workers that may be part of the construction activities. Consequently, workers would be reminded that their children should not be brought to the Site because of the inherent dangers associated with site grading, clearing, and construction. The Site Safety Plan would consider adequate measures to protect children during the implementation of the Proposed Action or Alternatives. Such measures may include barrier fencing and warning signs at the project Site and implementation of dust control measures. Implementing a Site Safety Plan would mitigate any potential impacts on children to a less than significant level.

4.10.2 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on geology and soils would occur. Impacts on geology and soils would be less than significant and no additional mitigation or minimization measures would be required.

4.11 UTILITIES/INFRASTRUCTURE

Issues and concerns regarding the impacts on infrastructure are typically related to the availability of necessary infrastructure to support the project and the creation of excess demand on those systems such that they must be changed of updated.

4.11.1 Proposed Action, Alternative A, and Alternative B

Potential effects on utilities and infrastructure if the Proposed Action or Alternatives would be implemented include effects on electricity and traffic.

The main purpose of the Proposed Action, Alternative A, or Alternative B, would be to increase the use of renewable energy and reduce the demand on regional power sources. Based on annual energy demands as shown in Table 3-16, the operation of a 1-MW solar array would result in approximately 3,106 MW per year produced from the solar array (Appendix B, Table B-1), or 9.5 percent of the yearly demand. Since the numerical goal would be to generate not less than 7.5 percent of the demand in fiscal year 2013 and beyond, implementing the Proposed Action, Alternative A, or Alternative B would achieve the goal. Cost for electricity in 2007 was approximately $1,666,000 (CMAFS Energy Manager 2009). Savings would be expected to be approximately $158,270 per year, based on cost for 2007.

Impacts on traffic would be the same for the Proposed Action, Alternative A, and Alternative B. Minor adverse impacts on traffic would occur when the construction equipment is mobilized and demobilized and when the construction workers arrive and depart the selected Site; however, because the number of vehicles and pieces of construction is small, no significant impacts would be expected.

4.11.2 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on utilities and infrastructure would occur. Impacts on utilities and infrastructure would be less than significant and no additional mitigation or minimization measures would be required.

4.11.3 Significance/Mitigation Measures

To reduce the potential impact of mobilization and demobilization from the Site on other base traffic, the heavy equipment (i.e., bulldozer, crane, dump trucks, backhoe, grader auger drill rig, etc.) will enter Norad Road after 8:30 AM and leave the base prior to 4:00 PM.

4.12 VISUAL RESOURCES/AESTHETICS

4.12.1 Proposed Action

The solar array would be oriented in a flat-plane southerly-facing direction. Because the elevation of the array would be over 500 feet above highway traffic, oriented in a flat plane (parallel to the ground surface), and behind buildings to the east of the Site, it is unlikely that it would be visible except to anyone above the plane of the array. Consequently, impacts on visual resources and aesthetics would be expected to be less than significant. No mitigation measures would be required.

4.12.2 Alternative A

The Alternative A Site would not be behind any buildings, but the solar array would be partially hidden from view by stands of 6 to 10 feet high oak scrub to the east and south of the Site. It is unlikely that it would be visible except to anyone above the plane of the array. Consequently, impacts on visual resources and aesthetics would be expected to be less than significant. No mitigation measures would be required.

4.12.3 Alternative B

The Alternative B Site would not be behind any buildings, but the solar array would be partially hidden from view by stands of 6 to 10 feet high oak scrub, oak-pine and pine woodlands to the east and south of the Site. It is unlikely that it would be visible except to anyone above the plane of the array. Consequently, impacts on visual resources and aesthetics would be expected to be less than significant. No mitigation measures would be required.

4.12.4 No-Action Alternative

If the No-Action Alternative is implemented no new impacts on visual resources and aesthetics would occur. Impacts on utilities and infrastructure would be less than significant and no additional mitigation or minimization measures would be required.

4.13 WATER RESOURCES

4.13.1 Proposed Action, Alternative A, and Alternative B

Under the Proposed Action, Alternative A, or Alternative B adverse short-term and long-term effects on water resources at CMAFS would be unlikely. The Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management directs federal agencies to work with states, tribes, local governments, private landowners, and other interested parties to take a watershed approach to federal land and resource management. This policy guides the protection of water quality and aquatic ecosystem health by reducing polluted runoff, improving natural resources stewardship, and increasing public involvement in watershed management on federal lands. Watershed planning includes assessing and

monitoring watershed conditions and identifying priority watersheds on which to focus financial aid and other resources. Due to steep topography and the absence of any permanent water sources on CMAFS, water resources management is limited to controlling the velocity and volume of storm water runoff carrying sediment to Fountain Creek. Erosion control measures at CMAFS are directed at the right-of-way for Norad Road.

Clearing, grading, and Site preparation associated with the Proposed Action or Alternatives could potentially affect storm water runoff. Potential impacts include disruption of natural drainage patterns, contamination entering storm water discharge, or heavy sediment loading from construction activities. Mitigation measures as described in Section 4.13.3 would be implemented to reduce the potential impacts on water resources to a less than significant level.

4.13.2 No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on water resources would occur. Impacts on water resources would be less than significant and no additional mitigation or minimization measures would be required.

4.13.3 Significance/Mitigation Measures

Preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP) would minimize adverse impacts. The SWPPP would provide construction and post-construction best management practices (BMPs) intended to control and manage the loading of sediment and other pollutants to levels that would minimize degradation of downstream water quality. Compliance with Air Force Engineering Technical Letter (ETL) 03-1: Storm Water Construction Standards requires implementation of BMPs to reduce stormwater discharges and pollutant loadings to preconstruction levels or better. A stormwater control site plan would be required by the construction contractor and must contain a National Pollutant Discharge Elimination System (NPDES) permit declaration.

A negligible increase in stormwater volume would result from the reduction of pervious surfaces on the installation as a consequence of constructing concrete footings for the arrays. BMPs would be implemented to reduce post-construction runoff peak flows from the increased impervious surfaces, including post-construction grading to restore original grade to those areas where solar panel arrays are placed and trenching for conduit occurs. No solar panel arrays or conduit would be located in drainages.

Construction BMPs would also be implemented to decrease sedimentation by erosion. Common BMPs for construction activities would be followed to minimize erosion. Preventive BMPs include the following:

- Limit stockpiling of materials on-site;
- Manage stockpiled materials to minimize the time between delivery and use;
- Cover stockpiled materials with tarps;
- Install snow or silt fences around material stockpiles, storm water drainage routes, culverts, and drains; and
- Install hay or fabric filters, netting, and mulching around material stockpiles, storm water drainage routes, culverts, and drains.

Construction would slightly increase impermeable surfaces. The construction activities and the associated slight increased amount of impervious surface would have adverse, negligible, short-term impacts on surface waters at CMAFS.

All specifications and plans for proposed projects or undertakings would be reviewed for potential effects on soil stability.

Post-construction revegetation of the area down-gradient of the selected Site would minimize long-term sediment loading and reduce runoff velocity to drainage channels and culverts.

4.14 CUMULATIVE EFFECTS

The CEQ regulations implementing the procedural provisions of NEPA define cumulative effects as follows:

"The impact on the environment (that) results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7 [1997])."

The potential for construction at CMAFS is limited by constraints on available space and the existence of steep slopes over much of the site. According to the General Plan, the only areas expected to experience new development or changes in native vegetation from mission activities are near the office complex and buildings along the access road and in the 300 area.

Three concepts would incorporate a landscaped berm along the west side of the main access road of the 300 area. The berm would help to screen the buildings from the neighboring residences at Broadmoor Bluffs.
However, no specific plans have been developed for future construction or growth at CMAFS. In addition to the projects ongoing at CMAFS, activities outside of the CMAFS boundaries would affect the natural resources there. Land to the west and south of CMAFS are managed by the USFS, Pikes Peak District, and the Cheyenne Mountain State Park, and no work is being planned in either of those areas. North and northeast of CMAFS boundaries are residential communities. Development of these communities is expected to continue and would likely be built up to the boundary fence. During the construction phase, some wildlife species and individuals within species would likely experience an increase in alert behavior, energy expenditure, and stress levels. Short-term effects on large mammals such as mule deer could result in displacement or alteration of behavior to avoid human activity. Since Colorado receives about 300 days of sun per year, the state provides an excellent platform for solar power. Solar electric, or photovoltaic, systems convert the renewable energy of the sun into useful electricity. Other future and present day solar array projects are described below.

4.14.1 Future Solar Projects

4.14.1.1 United States Air Force Academy (USAFA)

The United States government has contracted with Colorado Springs Utilities for the provision of reliable electric power generation through the payment of an $18.3 million connects charge. As the provider of electric service to USAFA, Colorado Springs Utilities will design, build, own, and operate a Solar Array that will generate renewable electricity for use by the Academy. The 4- to 5-megawatt Solar Array will produce approximately 4 to 7 percent of the total power requirement for the Academy. This project will

be completely funded by the USAFA and will not impact Colorado Springs Utilities electric rates. The plant will be funded entirely with federal stimulus money provided to the Academy. Artist rendering of proposed solar array is shown in Figure 4-5.

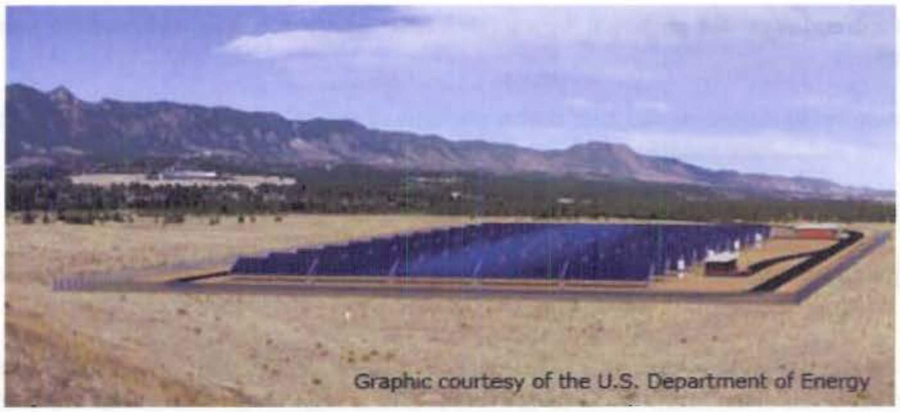

Figure 4-5

Artist Rendition of Air Force Academy Solar Array

4.14.2 Colorado Springs Airport

The Colorado Springs Airport has requested stimulus money to design, build, and operate a PV solar array that would supply up to 10 percent of the needed energy to operate the airport. The proposed PV array would cost an estimated $15 million dollars.

4.14.3 Current Solar Projects

3 Phases Energy Services, LLC, SunTechnics Energy Systems, Inc., and Morgan Stanley, developed, engineered, installed and financed a 2-megawatt (MW), ground-mounted solar photovoltaic (PV) array at Fort Carson, CO. This landmark PV project covers nearly 12 acres at Fort Carson making it the largest solar array at a U.S. Army facility and one of the largest in Colorado. The PV array will generate 3,200 megawatt-hours (MWh) of solar power annually, reflecting the U.S. Army's strong commitment to clean, renewable energy. "Using Colorado's abundant sunshine and available federal land to continue charting a new course for our energy future made sense," said Ft. Carson Utilities Manager Vince Guthrie, who was instrumental in bringing solar power to Fort Carson.

4.14.4 Combined Effects of Solar Projects

While there may be a potential for minor adverse effects on biological resources; sitting of the projects would minimize these effects to less than significant. The beneficial effects are that these systems are easy on the environment (since solar power does not use fossil fuels, these systems are pollution free) and help meet climate change regulations, and reduces the demand for electricity from non-renewable sources.

Overall, the Proposed Action, Alternative A, Alternative B, or the No Action Alternative would not have a long-term, negative cumulative effect on the resources at CMAFS or on resources in the Colorado Springs area.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA requires an analysis of significant irreversible effects. Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of nonrenewable resources such as metal, wood, fuel, paper, and other natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Another impact that falls under the category of the irreversible and irretrievable commitment of resources is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment. No irreversible or irretrievable effects are expected from implementing either of the alternatives. Under the two alternatives, cultural resources and protected habitats would not be adversely affected. Likewise, both alternatives would have a negligible to beneficial effect on net consumption of resources.

4.16 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts would result from implementation of the Proposed Action.

4.16.1 Biological Resources

Under the Proposed Action, construction activities, such as grading, excavating, and contouring of the soil, would result in vegetation removal and subsequent habitat loss for wildlife. Implementation of BMPs during and after construction, re-vegetation with native species and the limited footprint of the solar array would limit potential effects resulting from construction. Although unavoidable, these impacts on wildlife at the installation would not be considered significant.

4.17 COMPATIBILITY OF THE PROPOSED ACTION AND ALTERNATIVES WITH THE OBJECTIVES OF FEDERAL, REGIONAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

Impacts on the ground surface as a result of the Proposed Action would occur entirely within the boundaries of CMAFS. Construction of the new solar array would not result in any incompatible land uses on or off installation. The proposed location was selected according to existing land use zones. Consequently, construction would not conflict with installation land use policies or objectives. The Proposed Action would not conflict with any applicable off-installation land use ordinances or designated clear zones.

4.18 RELATIONSHIP BETWEEN THE SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Short-term uses of the biophysical components of the human environment include direct construction-related disturbances and direct impacts associated with an increase in population and activity that occurs over a period of less than 2 years. Long-term uses of the human environment include those impacts that occur over a period of more than 2 years, including permanent resource loss.

Several kinds of activities could result in short-term resource uses that compromise long-term productivity. Loss of important habitats and consumptive use of high-quality water at nonrenewable rates are examples of actions that affect long-term productivity.

The Proposed Action would not result in a significant intensification of land use at CMAFS or the surrounding area. The Proposed Action does not represent a significant loss of open space. Therefore, it is anticipated that the Proposed Action would not result in any cumulative land use or aesthetic impacts. Long-term productivity of this site would be increased by the development of the Proposed Action.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible environmental changes that would result from implementation of the Proposed Action involve the consumption of material, energy, land, biological, and human resources. The use of these resources would be permanent. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable time frame (e.g., energy and minerals). Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the Proposed Action.

4.19.1 Material Resources

Material resources irretrievably utilized for the Proposed Action include solar panels, concrete, and various material supplies (for infrastructure). Such materials are not in short supply, would not limit other unrelated construction activities, and their irretrievable use would not be considered significant.

4.19.2 Energy Resources

Energy resources utilized for the Proposed Action would be irreversibly lost. These include petroleum-based products (such as gasoline and diesel), natural gas, and electricity. During construction, gasoline and diesel would be used for the operation of construction vehicles. During operation, gasoline would be used for the operation of private and government-owned vehicles. Consumption of these energy resources would not place a significant demand on their availability in the Colorado Springs area.

Therefore, no significant adverse impacts would be expected. The energy produced by the solar array would provide a long term renewable energy source for CMAFS, and would be considered beneficial.

4.19.3 Biological Resources

The Proposed Action would result in minimal, irretrievable loss of vegetation and wildlife habitat on the proposed construction site.

4.19.4 Human Resources

The use of human resources for construction and operation is considered an irretrievable loss, only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the Proposed Action represents employment opportunities, and would be considered beneficial.

5.0 CONSULTATION AND COORDINATION

5.1 SCOPING

The public and other state and federal agencies were provided with an opportunity to comment on the scoping and assessment of this EA for a 1-MW Solar Array at CMAFS. A public notice was posted in the Gazette, the primary newspaper for the Colorado Springs area. No public scoping meetings were held for the preparation of this EA.

5.2 PUBLIC REVIEW

This EA was available for a 30-day public review from February 12, 2010 through March 15, 2010. A Notice of Availability was posted in the Colorado Springs Gazette on Wednesday February 10, 2010 and Sunday February 14, 2010. Copies of the three comments and the Air Force response are provided in Appendix E.

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8.0 ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
AC	alternating current
AFI	Air Force Instruction
AFH	Air Force Handout
AFS	Air Force Station
AFSPC	Air Force Space Command
AFTAC	Air Force Technical Applications Center
Air Force	United States Air Force
AICUZ	air installation compatible use zone/land
APCD	Air Pollution Control Division
APEN	Air Pollution Emission Notice
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CESQG	conditionally exempt small quantity generator
CFR	Code of Federal Regulations
CH_4	methane
CMAFS	Cheyenne Mountain Air Force Station
CMD	Cheyenne Mountain Directorate
CMOC	Cheyenne Mountain Operations Center
CNHP	Colorado Natural Heritage Program
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
CSU	Colorado Springs Utilities
dB	decibel
dBA	A-weighted decibel
DC	direct current
DIA	Defense Intelligence Agency
DOD	Department of Defense
DRMS	Defense Reutilization and Marketing Service
EA	Environmental Assessment
EO	Executive Order
EIS	Environmental Impact Statement
EPACT	Energy Policy Act of 2005
ESA	Endangered Species Act
ETL	engineering technical letter
FAA	Federal Aviation Administration

FEP	Facilities Excellence Plan
FONSI	Finding Of No Significant Impact
FRMB	front range mountain backdrop
GHG	greenhouse gases
GIS	geographical information system
Hazmat	hazardous materials
HMMG	Hazardous Material Management Guides
Hazmart	hazardous material pharmacy
ICP	Integrated Contingency Plan
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
ISW	industrial solid waste
ITW/AA	integrated tactical warning/attack assessment
kVA	kilovolts amperes
kWh	kilowatt hours
Ldn	day-night average noise level
MBTA	Migratory Bird Treaty Act
MSG	Mission Support Group
MSL	mean sea level
MSW	municipal solid waste
MVA	megavolt amperes
MW	megawatt
MWh	megawatt hours
NAAQS	National Ambient Air Quality Standards
NEC	National Electric Code
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO_2	nitrogen dioxide
NOAA	National Oceanic Atmospheric Administration
NORAD	North American Aerospace Defense
NRHP	National Register of Historic Places
O_3	ozone
PIF	Partners in Flight
PL	Public Law
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
POL	petroleum, oils, and lubricants
PPACG	Pike's Peak Area Council of Government
ppm	parts per million
PSD	prevention of significant deterioration
REC	renewable energy credits

RONA	record of non-applicability
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
TCP	Traditional Cultural Properties
tpy	tons per year
USDA	United States Department of Agriculture
USC	United States Code
U.S. EPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USNORTHCOM	United States Northern Command
USSTRATCOM	United States Strategic Command
WAPA	Western Area Power Association

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APPENDIX A – AIR QUALITY DATA AND CALCULATIONS

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CONSTRUCTION ACTIVITY EMISSIONS SUMMARY

CHEYENNE MOUNTAIN AFS SOLAR POWER-SYSTEM - PROPOSED PROJECT

CONSTRUCTION YEAR: 2010

EQUIPMENT USE SUMMARY:

PROJECT PHASE	ACTIVITY DURATION, WORKING DAYS	ACREAGE SUBJECT TO DISTURBANCE	NUMBER OF EQUIPMENT ITEMS	HOURS OF ON-SITE EQUIPMENT USE	TOTAL EQUIPMENT FUEL USE, GALLONS	TRUCK TRAFFIC (1-way trips) TRUCK TRIPS TO/ FROM SITE	TRUCK TRIPS PER DAY
SITE PREP	12	10.3	10	240	457	120	10
FOOTINGS, PADS, BLDG	48	4.3	12	624	1,377	384	8
ARRAY INSTALLATION	90	2.8	4	297	1,019	360	4
FENCING	15	2.0	3	75	177	60	4
NET WORKING DAYS AND TOTALS:	**165**			**1,236**	**3,031**	**924**	**10**
MINIMUM PHASE:		**2.0**	**3**				**4**
MEAN OVER NET WORK PERIOD:		**3.7**	**7**				**6**
MAXIMUM PHASE:		**10.3**	**12**				**10**

No overlap among phases.

CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **Total Work Days =** 165

PHASE	WORK DAYS PER QUARTER Q1	Q2	Q3	Q4
SITE PREP	0	12	0	0
FOOTINGS, PADS, BLDG	0	48	0	0
ARRAY INSTALLATION	0	0	64	26
FENCING	0	0	0	15
Available Work Days per Quarter	**61**	**64**	**64**	**64**

POLLUTANT	EMISSIONS BY QUARTER, TONS Q1	Q2	Q3	Q4
ROG	0.00	0.14	0.01	0.00
NOx	0.00	0.16	0.05	0.03
CO	0.00	0.48	0.05	0.03
SOx	0.00	0.03	0.01	0.01
PM_{10}	0.00	0.05	0.01	0.01

Note: Analysis assumes a 5-day work week with allowances for major holidays.

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: 2010

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	20.41	7.44	35.47	1.10	0.66	0.60	0.65
	Fugitive Dust	0.00	0.00	0.00	0.00	5.16	1.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**20.41**	**7.44**	**35.47**	**1.10**	**5.82**	**1.63**	**0.65**
FOOTINGS, PADS, BLDG	Equipment	0.93	4.66	10.99	0.83	0.45	0.41	0.44
	Fugitive Dust	0.00	0.00	0.00	0.00	0.36	0.07	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.93**	**4.66**	**10.99**	**0.83**	**0.81**	**0.48**	**0.44**
ARRAY INSTALLATION	Equipment	0.20	1.48	1.48	0.34	0.16	0.15	0.16
	Fugitive Dust	0.00	0.00	0.00	0.00	0.07	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.20**	**1.48**	**1.48**	**0.34**	**0.24**	**0.16**	**0.16**
FENCING	Equipment	0.31	2.03	1.76	0.34	0.20	0.18	0.20
	Fugitive Dust	0.00	0.00	0.00	0.00	0.62	0.12	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.31**	**2.03**	**1.76**	**0.34**	**0.82**	**0.31**	**0.20**
TOTALS	**Equipment**	**21.85**	**15.61**	**49.69**	**2.61**	**1.46**	**1.34**	**1.45**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**6.22**	**1.24**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**21.85**	**15.61**	**49.69**	**2.61**	**7.68**	**2.59**	**1.45**
MAXIMUM DAY	**Equipment**	20.41	7.44	35.47	1.10	0.66	0.60	0.65
	Fugitive Dust	0.00	0.00	0.00	0.00	5.16	1.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	20.41	7.44	35.47	1.10	**5.82**	**1.63**	**0.65**

Totals apply only if phase durations or subarea sequencings require all phases to overlap at some point during the construction period.
No overlap among phases.
Maximum day estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PMo is the size with 50% mass

collection efficiency in a certified sampler, not an upper particle size limit

$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

DPM = diesel particulate matter (carcinogen)

CRITERIA POLLUTANT EMISSIONS FOR CONSTRUCTION YEAR: 2010

PROJECT PHASE	COMPONENT	TOTAL EMISSIONS, TONS PER YEAR						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	0.12	0.04	0.21	0.01	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.03	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.12**	**0.04**	**0.21**	**0.01**	**0.03**	**0.01**	**0.00**
FOOTINGS, PADS, BLDG	Equipment	0.02	0.11	0.26	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.02**	**0.11**	**0.26**	**0.02**	**0.02**	**0.01**	**0.01**
ARRAY INSTALLATION	Equipment	0.01	0.07	0.07	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.07**	**0.07**	**0.02**	**0.01**	**0.01**	**0.01**
FENCING	Equipment	0.00	0.02	0.01	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.002**	**0.02**	**0.01**	**0.003**	**0.01**	**0.002**	**0.00**
TOTALS	**Equipment**	**0.16**	**0.24**	**0.56**	**0.04**	**0.02**	**0.02**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.16**	**0.24**	**0.56**	**0.04**	**0.07**	**0.03**	**0.02**
MAX CALENDAR QUARTER	**Equipment**	**0.14**	**0.16**	**0.48**	**0.03**	**0.01**	**0.01**	**0.01**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.14**	**0.16**	**0.48**	**0.03**	**0.05**	**0.02**	**0.01**

Maximum calendar quarter estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.

ROG = reactive organic compounds (ozone precursor)

NOx = nitrogen oxides (ozone precursor)

CO = carbon monoxide

SOx = sulfur oxides

PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{0} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

DPM = diesel particulate matter (carcinogen)

FUGITIVE EMISSIONS DETAILS BY PHASE:

PARAMETER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Assumed Soil Texture Class	sandy loam	sandy loam	sandy loam	sandy loam
Soil PM_{10} Fraction	20.0%	20.0%	20.0%	20.0%
Dust Control Program Effectiveness	50%	50%	50%	0%
Area Disturbed on a Typical Day, acres	0.86	0.09	0.03	0.13
Days of Distrubance	12	48	90	15
Uncontrolled TSP Rate, lbs/acre-day	60.0	40.0	24.0	24.0
Controlled PM_{10} Rate, lbs/acre-day	6.0	4.0	2.4	4.8
Demolition PM_{10}, total pounds	0	0	0	0
Construction Blasting PM_{10}, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
$PM_{2.5}$ fraction of engine exhaust PM_{10}	92.0%	92.0%	92.0%	92.0%
$PM_{2.5}$ fraction of fugitive dust PM_{10}	20.0%	20.0%	20.0%	20.0%
$PM_{2.5}$ fraction of spray paint PM_{10}	91.2%	91.2%	91.2%	91.2%

PM2.5 fractions of diesel engine exhaust PM10 and spray paint PM10 are based on data from the California Air Resources Board CEIDARS (California Emission Inventory Data and Reporting System) database, as presented in Appendix A of SCAQMD 2003, Final Methodology to Calculate PM2.5 and PM2.5 Significance Thresholds.

PM2.5 fraction of fugitive dust PM10 based on typical clay and fine silt content for soils texture class.

Default PM2.5 fractions from CEIDARS database are 92% for diesel engine exhaust, 20.8% for fugitive dust, and 91.2% for spray paint.

GLOBAL WARMING POTENTIAL DATA SET SELECTION:

DATA SOURCE	DATA SET CODE	GWP FOR CH_4	GWP FOR N_2O
IPCC 2nd Assessment, 1995:	1	21	310
IPCC 3rd Assessment, 2001:	2	23	296
IPCC 4th Assessment, 2007:	3	25	298

SELECTED GWP DATA SET (1, 2, or 3) =	3	**<== Enter code for selected data set.**
CH_4 factor:	25	
N_2O factor:	298	

GREENHOUSE GAS EMISSIONS SUMMARY: 2010

PROJECT PHASE	AVERAGE DAILY GHG EMISSIONS, POUNDS PER DAY			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	831.8	0.04	0.03	**840.2**
FOOTINGS, PADS, BLDG	632.3	0.03	0.02	**639.3**
ARRAY INSTALLATION	250.9	0.01	0.01	**254.1**
FENCING	262.2	0.01	0.01	**265.4**
MAXIMUM DAY:	**831.8**	**0.04**	**0.03**	**840.2**

PROJECT PHASE	TOTAL GHG EMISSIONS, TONS PER YEAR			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	5.0	0.0002	0.0002	**5.0**
FOOTINGS, PADS, BLDG	15.2	0.001	0.001	**15.3**
ARRAY INSTALLATION	11.3	0.001	0.0004	**11.4**
FENCING	2.0	0.0001	0.0001	**2.0**
MAXIMUM QUARTER:	**20.2**	**0.001**	**0.001**	**20.4**
CONSTRUCTION PERIOD TOTALS:	**33.4**	**0.002**	**0.001**	**33.8**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame
Maximum day estimates based on expected overlaps among construction phases.

FORMATTED FOOTNOTE SETS:

GWP Data Set 1 footnotes:

CH_4 = methane; GWP multiplier = 21

N_2O = nitrous oxide; GWP multiplier = 310

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 1995 second assessment report, 100 year time frame

GWP Data Set 2 footnotes:

CH_4 = methane; GWP multiplier = 23

N_2O = nitrous oxide; GWP multiplier = 296

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2001 third assessment report, 100 year time frame

GWP Data Set 3 footnotes:

CH_4 = methane; GWP multiplier = 25

N_2O = nitrous oxide; GWP multiplier = 298

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

CALENDAR QUARTER CRITERIA POLLUTANT EMISSIONS: **2010**

CALENDAR QUARTER	COMPONENT	CRITERIA POLLUTANT EMISSIONS, TONS BY CALENDAR QUARTER						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
QUARTER 1	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
QUARTER 2	Equipment	0.14	0.16	0.48	0.03	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.04	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.14**	**0.16**	**0.48**	**0.03**	**0.05**	**0.02**	**0.01**
QUARTER 3	Equipment	0.01	0.05	0.05	0.01	0.01	0.00	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.05**	**0.05**	**0.01**	**0.01**	**0.01**	**0.01**
QUARTER 4	Equipment	0.00	0.03	0.03	0.01	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.03**	**0.03**	**0.01**	**0.01**	**0.00**	**0.00**
MAXIMUM QUARTER	**Equipment**	**0.14**	**0.16**	**0.48**	**0.03**	**0.01**	**0.01**	**0.01**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.14**	**0.16**	**0.48**	**0.03**	**0.05**	**0.02**	**0.01**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CALENDAR QUARTER GHG EMISSIONS: 2010

CALENDAR QUARTER	GHG EMISSIONS, TONS BY CALENDAR QUARTER			
	CO_2	CH_4	N_2O	GWP, CO_2e
QUARTER 1	0.0	0.000	0.000	**0.0**
QUARTER 2	20.2	0.001	0.001	**20.4**
QUARTER 3	8.0	0.000	0.000	**8.1**
QUARTER 4	5.2	0.000	0.000	**5.3**
MAXIMUM QUARTER	**20.2**	**0.001**	**0.001**	**20.4**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

EQUIPMENT USE DETAILS, PHASE 1: SITE PREP

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	1	2	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	4	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	1	2	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	1	6	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	2	6	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	0	0	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	2	2	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	1	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor, operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 2: FOOTINGS, PADS, BLDG

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr	CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
							ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62	75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	2	2.97	48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08	22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76	403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19	938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
Small Trencher, < 25 HP	20	64%	85%	1	4	0.74	13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	2	1.80	26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	1	1	1.20	12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
Small Concrete Pump, 25 - 75 HP	70	62%	75%	1	1	2.52	28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	2	1	0.69	79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42	28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35	22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	1	1	5.95	25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	1	1	8.18	34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92	37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr	CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
							ROG	NO_x	CO	SO_x	PM10	CO_2	CH_4	N_2O
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62	75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97	48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08	22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76	403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19	938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74	13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	1	1.80	26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20	12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52	28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69	79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42	28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35	22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95	25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18	34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92	37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
not used	1	100%	100%	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

EQUIPMENT USE DETAILS, PHASE 4: FENCING

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	3	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	3	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	0	0	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor, operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NO_x	CO	SO_x	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Vehicle Traffic Estimates for CMAFS Solar Array Project

VEHICLE TRAFFIC ESTIMATES, DAILY 1-WAY TRIPS																				
		PROPOSED	ALTERNATIVE			GRAMS/VMT			PROPOSED PROJECT, TONS				ALTERNATIVE A, TONS				ALTERNATIVE B, TONS			
PHASE	TRIP TYPE	PROJECT	A	B	VOC	NOX	CO	CO2	VOC	NOX	CO	CO2	VOC	NOX	CO	CO2	VOC	NOX	CO	CO2
Site Prep	Workers	20	20	24																
	Trucks	10	10	10																
	TOTAL	**30**	**30**	**34**																
	Work Days	12	14	20																
	LDV mi/trip	18	18	18																
	Truck mi/trip	25	25	25																
	Total LDV VMT	4,320	5,040	8,640	0.79	1.47	10.86	425.97	0.004	0.007	0.052	2.028	0.004	0.008	0.060	2.367	0.008	0.014	0.103	4.057
	Total Truck VMT	3,000	3,500	5,000	0.77	6.87	4.27	1,402.29	0.003	0.023	0.014	4.637	0.003	0.027	0.016	5.410	0.004	0.038	0.024	7.729
	TOTAL VMT	7,320	8,540	13,640					**0.006**	**0.030**	**0.066**	**6.666**	**0.007**	**0.035**	**0.077**	**7.777**	**0.012**	**0.052**	**0.127**	**11.786**
Trenching & Pads	Workers	16	16	16																
	Trucks	8	8	8																
	TOTAL	**24**	**24**	**24**																
	Work Days	48	48	48																
	LDV mi/trip	18	18	18																
	Truck mi/trip	25	25	25																
	Total LDV VMT	13,824	13,824	13,824	0.79	1.47	10.86	425.97	0.012	0.022	0.165	6.491	0.012	0.022	0.165	6.491	0.012	0.022	0.165	6.491
	Total Truck VMT	9,600	9,600	9,600	0.77	6.87	4.27	1,402.29	0.008	0.073	0.045	14.839	0.008	0.073	0.045	14.839	0.008	0.073	0.045	14.839
	TOTAL VMT	23,424	23,424	23,424					**0.020**	**0.095**	**0.211**	**21.330**	**0.020**	**0.095**	**0.211**	**21.330**	**0.020**	**0.095**	**0.211**	**21.330**
Installation	Workers	24	24	24																
	Trucks	4	4	4																
	TOTAL	**28**	**28**	**28**																
	Work Days	90	90	90																
	LDV mi/trip	18	18	18																
	Truck mi/trip	25	25	25																
	Total LDV VMT	38,880	38,880	38,880	0.79	1.47	10.86	425.97	0.034	0.063	0.465	18.256	0.034	0.063	0.465	18.256	0.034	0.063	0.465	18.256
	Total Truck VMT	9,000	9,000	9,000	0.77	6.87	4.27	1,402.29	0.008	0.068	0.042	13.912	0.008	0.068	0.042	13.912	0.008	0.068	0.042	13.912
	TOTAL VMT	47,880	47,880	47,880					**0.041**	**0.131**	**0.508**	**32.168**	**0.041**	**0.131**	**0.508**	**32.168**	**0.041**	**0.131**	**0.508**	**32.168**
Fencing	Workers	8	8	8																
	Trucks	4	4	4																
	TOTAL	**12**	**12**	**12**																
	Work Days	15	15	20																
	LDV mi/trip	18	18	18																
	Truck mi/trip	25	25	25																
	Total LDV VMT	2,160	2,160	2,880	0.79	1.47	10.86	425.97	0.002	0.004	0.026	1.014	0.002	0.004	0.026	1.014	0.003	0.005	0.034	1.352
	Total Truck VMT	1,500	1,500	2,000	0.77	6.87	4.27	1,402.29	0.001	0.011	0.007	2.319	0.001	0.011	0.007	2.319	0.002	0.015	0.009	3.092
	TOTAL VMT	3,660	3,660	4,880					**0.003**	**0.015**	**0.033**	**3.333**	**0.003**	**0.015**	**0.033**	**3.333**	**0.004**	**0.020**	**0.044**	**4.444**
								TOTAL	0.05	0.10	0.71	27.79	0.05	0.10	0.72	28.13	0.06	0.10	0.77	30.16
									0.02	0.18	0.11	35.71	0.02	0.18	0.11	36.48	0.02	0.19	0.12	39.57
									0.07	**0.27**	**0.82**	**63.50**	**0.07**	**0.28**	**0.83**	**64.61**	**0.08**	**0.30**	**0.89**	**69.73**

CONSTRUCTION ACTIVITY EMISSIONS SUMMARY

CHEYENNE MOUNTAIN AFS SOLAR POWER-SYSTEM - ALTERNATIVE A

CONSTRUCTION YEAR: **2010**

EQUIPMENT USE SUMMARY:

PROJECT PHASE	ACTIVITY DURATION, WORKING DAYS	ACREAGE SUBJECT TO DISTURBANCE	NUMBER OF EQUIPMENT ITEMS	HOURS OF ON-SITE EQUIPMENT USE	TOTAL EQUIPMENT FUEL USE, GALLONS	TRUCK TRAFFIC (1-way trips) TRUCK TRIPS TO/ FROM SITE	TRUCK TRIPS PER DAY
SITE PREP	14	10.1	10	280	533	140	10
FOOTINGS, PADS, BLDG	48	4.3	12	624	1,377	384	8
ARRAY INSTALLATION	90	2.8	4	297	1,019	360	4
FENCING	15	2.0	3	75	177	60	4
NET WORKING DAYS AND TOTALS:	**167**			**1,276**	**3,107**	**944**	**10**
MINIMUM PHASE:		**2.0**	**3**				**4**
MEAN OVER NET WORK PERIOD:		**3.8**	**7**				**6**
MAXIMUM PHASE:		**10.1**	**12**				**10**

No overlap among phases.

CALENDAR QUARTER PHASE OVERLAP CALCULATOR: 167 **Total Work Days =**

PHASE	WORK DAYS PER QUARTER			
	Q1	Q2	Q3	Q4
SITE PREP	0	14	0	0
FOOTINGS, PADS, BLDG	0	48	0	0
ARRAY INSTALLATION	0	0	64	26
FENCING	0	0	0	15
Available Work Days per Quarter	**61**	**64**	**64**	**64**
POLLUTANT	**EMISSIONS BY QUARTER, TONS**			
	Q1	**Q2**	**Q3**	**Q4**
ROG	0.00	0.17	0.01	0.00
NOx	0.00	0.16	0.05	0.03
CO	0.00	0.51	0.05	0.03
SOx	0.00	0.03	0.01	0.01
PM_{10}	0.00	0.05	0.01	0.01

Note: Analysis assumes a 5-day work week with allowances for major holidays.

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: 2010

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	20.41	7.44	35.47	1.10	0.66	0.60	0.65
	Fugitive Dust	0.00	0.00	0.00	0.00	4.32	0.86	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**20.41**	**7.44**	**35.47**	**1.10**	**4.98**	**1.47**	**0.65**
FOOTINGS, PADS, BLDG	Equipment	0.93	4.66	10.99	0.83	0.45	0.41	0.44
	Fugitive Dust	0.00	0.00	0.00	0.00	0.36	0.07	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.93**	**4.66**	**10.99**	**0.83**	**0.81**	**0.48**	**0.44**
ARRAY INSTALLATION	Equipment	0.20	1.48	1.48	0.34	0.16	0.15	0.16
	Fugitive Dust	0.00	0.00	0.00	0.00	0.07	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.20**	**1.48**	**1.48**	**0.34**	**0.24**	**0.16**	**0.16**
FENCING	Equipment	0.31	2.03	1.76	0.34	0.20	0.18	0.20
	Fugitive Dust	0.00	0.00	0.00	0.00	0.62	0.12	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.31**	**2.03**	**1.76**	**0.34**	**0.82**	**0.31**	**0.20**
TOTALS	**Equipment**	**21.85**	**15.61**	**49.69**	**2.61**	**1.46**	**1.34**	**1.45**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**5.38**	**1.08**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**21.85**	**15.61**	**49.69**	**2.61**	**6.84**	**2.42**	**1.45**
MAXIMUM DAY	**Equipment**	20.41	7.44	35.47	1.10	0.66	**0.60**	**0.65**
	Fugitive Dust	0.00	0.00	0.00	0.00	4.32	**0.86**	**0.00**
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	TOTAL	20.41	7.44	35.47	1.10	4.98	**1.47**	**0.65**

Totals apply only if phase durations or subarea sequencings require all phases to overlap at some point during the construction period.
No overlap among phases.
Maximum day estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CRITERIA POLLUTANT EMISSIONS FOR CONSTRUCTION YEAR: 2010

PROJECT PHASE	COMPONENT	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
		TOTAL EMISSIONS, TONS PER YEAR						
SITE PREP	Equipment	0.14	0.05	0.25	0.01	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.03	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.14**	**0.05**	**0.25**	**0.01**	**0.03**	**0.01**	**0.00**
FOOTINGS, PADS, BLDG	Equipment	0.02	0.11	0.26	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.02**	**0.11**	**0.26**	**0.02**	**0.02**	**0.01**	**0.01**
ARRAY INSTALLATION	Equipment	0.01	0.07	0.07	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.07**	**0.07**	**0.02**	**0.01**	**0.01**	**0.01**
FENCING	Equipment	0.00	0.02	0.01	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.002**	**0.02**	**0.01**	**0.003**	**0.01**	**0.002**	**0.00**
TOTALS	**Equipment**	**0.18**	**0.25**	**0.59**	**0.05**	**0.02**	**0.02**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.18**	**0.25**	**0.59**	**0.05**	**0.07**	**0.03**	**0.02**
MAX CALENDAR QUARTER	**Equipment**	**0.17**	**0.16**	**0.51**	**0.03**	**0.02**	**0.01**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.17**	**0.16**	**0.51**	**0.03**	**0.05**	**0.02**	**0.02**

Maximum calendar quarter estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.

ROG = reactive organic compounds (ozone precursor)

NOx = nitrogen oxides (ozone precursor)

CO = carbon monoxide

SOx = sulfur oxides

PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

FUGITIVE EMISSIONS DETAILS BY PHASE:

PARAMETER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Assumed Soil Texture Class	sandy loam	sandy loam	sandy loam	sandy loam
Soil PM_{10} Fraction	20.0%	20.0%	20.0%	20.0%
Dust Control Program Effectiveness	50%	50%	50%	0%
Area Disturbed on a Typical Day, acres	0.72	0.09	0.03	0.13
Days of Distrubance	14	48	90	15
Uncontrolled TSP Rate, lbs/acre-day	60.0	40.0	24.0	24.0
Controlled PM_{10} Rate, lbs/acre-day	6.0	4.0	2.4	4.8
Demolition PM_{10}, total pounds	0	0	0	0
Construction Blasting PM_{10}, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
$PM_{2.5}$ fraction of engine exhaust PM_{10}	92.0%	92.0%	92.0%	92.0%
$PM_{2.5}$ fraction of fugitive dust PM_{10}	20.0%	20.0%	20.0%	20.0%
$PM_{2.5}$ fraction of spray paint PM_{10}	91.2%	91.2%	91.2%	91.2%

$PM_{2.5}$ fractions of diesel engine exhaust PM_{10} and spray paint PM_{10} are based on data from the California Air Resources Board CEIDAF (California Emission Inventory Data and Reporting System) database, as presented in Appendix A of SCAQMD 2003, Final Methodolo; to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds.

$PM_{2.5}$ fraction of fugitive dust PM_{10} based on typical clay and fine silt content for soils texture class.

Default $PM_{2.5}$ fractions from CEIDARS database are 92% for diesel engine exhaust, 20.8% for fugitive dust, and 91.2% for spray paint.

GLOBAL WARMING POTENTIAL DATA SET SELECTION:

DATA SOURCE	DATA SET CODE	GWP FOR CH_4	GWP FOR N_2O
IPCC 2nd Assessment, 1995:	1	21	310
IPCC 3rd Assessment, 2001:	2	23	296
IPCC 4th Assessment, 2007:	3	25	298

SELECTED GWP DATA SET (1, 2, or 3) =	3	**<== Enter code for selected data set.**
CH_4 factor:	25	
N_2O factor:	298	

GREENHOUSE GAS EMISSIONS SUMMARY: **2010**

PROJECT PHASE	AVERAGE DAILY GHG EMISSIONS, POUNDS PER DAY			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	831.8	0.04	0.03	**840.2**
FOOTINGS, PADS, BLDG	632.3	0.03	0.02	**639.3**
ARRAY INSTALLATION	250.9	0.01	0.01	**254.1**
FENCING	262.2	0.01	0.01	**265.4**
MAXIMUM DAY:	**831.8**	**0.04**	**0.03**	**840.2**

PROJECT PHASE	TOTAL GHG EMISSIONS, TONS PER YEAR			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	5.8	0.0002	0.0002	**5.9**
FOOTINGS, PADS, BLDG	15.2	0.001	0.001	**15.3**
ARRAY INSTALLATION	11.3	0.001	0.0004	**11.4**
FENCING	2.0	0.0001	0.0001	**2.0**
MAXIMUM QUARTER:	**21.0**	**0.001**	**0.001**	**21.2**
CONSTRUCTION PERIOD TOTALS:	**34.3**	**0.002**	**0.001**	**34.7**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame
Maximum day estimates based on expected overlaps among construction phases.

FORMATTED FOOTNOTE SETS:

GWP Data Set 1 footnotes:

CH_4 = methane; GWP multiplier = 21

N_2O = nitrous oxide; GWP multiplier = 310

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 1995 second assessment report, 100 year time frame

GWP Data Set 2 footnotes:

CH_4 = methane; GWP multiplier = 23

N_2O = nitrous oxide; GWP multiplier = 296

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2001 third assessment report, 100 year time frame

GWP Data Set 3 footnotes:

CH_4 = methane; GWP multiplier = 25

N_2O = nitrous oxide; GWP multiplier = 298

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

CALENDAR QUARTER CRITERIA POLLUTANT EMISSIONS: **2010**

CALENDAR QUARTER	COMPONENT	CRITERIA POLLUTANT EMISSIONS, TONS BY CALENDAR QUARTER						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
QUARTER 1	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
QUARTER 2	Equipment	0.17	0.16	0.51	0.03	0.02	0.01	0.02
	Fugitive Dust	0.00	0.00	0.00	0.00	0.04	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.17**	**0.16**	**0.51**	**0.03**	**0.05**	**0.02**	**0.02**
QUARTER 3	Equipment	0.01	0.05	0.05	0.01	0.01	0.00	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.05**	**0.05**	**0.01**	**0.01**	**0.01**	**0.01**
QUARTER 4	Equipment	0.00	0.03	0.03	0.01	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.03**	**0.03**	**0.01**	**0.01**	**0.00**	**0.00**
MAXIMUM QUARTER	**Equipment**	**0.17**	**0.16**	**0.51**	**0.03**	**0.02**	**0.01**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.17**	**0.16**	**0.51**	**0.03**	**0.05**	**0.02**	**0.02**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

CALENDAR QUARTER GHG EMISSIONS: 2010

CALENDAR QUARTER	GHG EMISSIONS, TONS BY CALENDAR QUARTER			
	CO_2	CH_4	N_2O	GWP, CO_2e
QUARTER 1	0.0	0.000	0.000	**0.0**
QUARTER 2	21.0	0.001	0.001	**21.2**
QUARTER 3	8.0	0.000	0.000	**8.1**
QUARTER 4	5.2	0.000	0.000	**5.3**
MAXIMUM QUARTER	**21.0**	**0.001**	**0.001**	**21.2**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

EQUIPMENT USE DETAILS, PHASE 1: SITE PREP

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	1	2	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	4	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	1	2	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	1	6	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	2	6	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	0	0	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	2	2	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	1	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 2: FOOTINGS, PADS, BLDG

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	2	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	1	4	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	2	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	1	1	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	1	1	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	2	1	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	1	1	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	1	1	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 3: ARRAY INSTALLATION

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	1	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 4: FENCING

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	3	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	3	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	0	0	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

CONSTRUCTION ACTIVITY EMISSIONS SUMMARY

CHEYENNE MOUNTAIN AFS SOLAR POWER-SYSTEM - ALTERNATIVE B

CONSTRUCTION YEAR: **2010**

EQUIPMENT USE SUMMARY:

PROJECT PHASE	ACTIVITY DURATION, WORKING DAYS	ACREAGE SUBJECT TO DISTURBANCE	NUMBER OF EQUIPMENT ITEMS	HOURS OF ON-SITE EQUIPMENT USE	TOTAL EQUIPMENT FUEL USE, GALLONS	TRUCK TRAFFIC (1-way trips)	
						TRUCK TRIPS TO/ FROM SITE	TRUCK TRIPS PER DAY
SITE PREP	20	17.2	10	400	762	200	10
FOOTINGS, PADS, BLDG	48	4.3	12	624	1,377	384	8
ARRAY INSTALLATION	90	2.8	4	297	1,019	360	4
FENCING	20	3.0	3	100	237	80	4
NET WORKING DAYS AND TOTALS:	**178**			**1,421**	**3,395**	**1,024**	**10**
MINIMUM PHASE:		**2.8**	**3**				**4**
MEAN OVER NET WORK PERIOD:		**4.8**	**7**				**6**
MAXIMUM PHASE:		**17.2**	**12**				**10**

No overlap among phases.

CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **178 Total Work Days =**

PHASE	WORK DAYS PER QUARTER			
	Q1	Q2	Q3	Q4
SITE PREP	0	20	0	0
FOOTINGS, PADS, BLDG	0	42	6	0
ARRAY INSTALLATION	0	0	58	32
FENCING	0	0	0	20
Available Work Days per Quarter	**61**	**64**	**64**	**64**
	EMISSIONS BY QUARTER, TONS			
POLLUTANT	**Q1**	**Q2**	**Q3**	**Q4**
ROG	0.00	0.22	0.01	0.01
NOx	0.00	0.17	0.06	0.04
CO	0.00	0.59	0.08	0.04
SOx	0.00	0.03	0.01	0.01
PM_{10}	0.00	0.08	0.01	0.01

Note: Analysis assumes a 5-day work week with allowances for major holidays.

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: 2010

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	20.41	7.44	35.47	1.10	0.66	0.60	0.65
	Fugitive Dust	0.00	0.00	0.00	0.00	5.16	1.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**20.41**	**7.44**	**35.47**	**1.10**	**5.82**	**1.63**	**0.65**
FOOTINGS, PADS, BLDG	Equipment	0.93	4.66	10.99	0.83	0.45	0.41	0.44
	Fugitive Dust	0.00	0.00	0.00	0.00	0.36	0.07	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.93**	**4.66**	**10.99**	**0.83**	**0.81**	**0.48**	**0.44**
ARRAY INSTALLATION	Equipment	0.20	1.48	1.48	0.34	0.16	0.15	0.16
	Fugitive Dust	0.00	0.00	0.00	0.00	0.07	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.20**	**1.48**	**1.48**	**0.34**	**0.24**	**0.16**	**0.16**
FENCING	Equipment	0.31	2.03	1.76	0.34	0.20	0.18	0.20
	Fugitive Dust	0.00	0.00	0.00	0.00	0.72	0.14	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.31**	**2.03**	**1.76**	**0.34**	**0.92**	**0.33**	**0.20**
TOTALS	**Equipment**	**21.85**	**15.61**	**49.69**	**2.61**	**1.46**	**1.34**	**1.45**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**6.31**	**1.26**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**21.85**	**15.61**	**49.69**	**2.61**	**7.77**	**2.60**	**1.45**
MAXIMUM DAY	**Equipment**	**20.41**	**7.44**	**35.47**	**1.10**	**0.66**	**0.60**	**0.65**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**5.16**	**1.03**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**20.41**	**7.44**	**35.47**	**1.10**	**5.82**	**1.63**	**0.65**

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: 2010

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	20.41	7.44	35.47	1.10	0.66	0.60	0.65
	Fugitive Dust	0.00	0.00	0.00	0.00	5.16	1.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**20.41**	**7.44**	**35.47**	**1.10**	**5.82**	**1.63**	**0.65**
FOOTINGS, PADS, BLDG	Equipment	0.93	4.66	10.99	0.83	0.45	0.41	0.44
	Fugitive Dust	0.00	0.00	0.00	0.00	0.36	0.07	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.93**	**4.66**	**10.99**	**0.83**	**0.81**	**0.48**	**0.44**
ARRAY INSTALLATION	Equipment	0.20	1.48	1.48	0.34	0.16	0.15	0.16
	Fugitive Dust	0.00	0.00	0.00	0.00	0.07	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.20**	**1.48**	**1.48**	**0.34**	**0.24**	**0.16**	**0.16**
FENCING	Equipment	0.31	2.03	1.76	0.34	0.20	0.18	0.20
	Fugitive Dust	0.00	0.00	0.00	0.00	0.72	0.14	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.31**	**2.03**	**1.76**	**0.34**	**0.92**	**0.33**	**0.20**
TOTALS	**Equipment**	**21.85**	**15.61**	**49.69**	**2.61**	**1.46**	**1.34**	**1.45**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**6.31**	**1.26**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**21.85**	**15.61**	**49.69**	**2.61**	**7.77**	**2.60**	**1.45**
MAXIMUM DAY	**Equipment**	**20.41**	**7.44**	**35.47**	**1.10**	**0.66**	**0.60**	**0.65**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**5.16**	**1.03**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**20.41**	**7.44**	**35.47**	**1.10**	**5.82**	**1.63**	**0.65**

Totals apply only if phase durations or subarea sequencings require all phases to overlap at some point during the construction period.
No overlap among phases.
Maximum day estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CRITERIA POLLUTANT EMISSIONS FOR CONSTRUCTION YEAR: 2010

PROJECT PHASE	COMPONENT	TOTAL EMISSIONS, TONS PER YEAR						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREP	Equipment	0.20	0.07	0.35	0.01	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.05	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.20**	**0.07**	**0.35**	**0.01**	**0.06**	**0.02**	**0.01**
FOOTINGS, PADS, BLDG	Equipment	0.02	0.11	0.26	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.02**	**0.11**	**0.26**	**0.02**	**0.02**	**0.01**	**0.01**
ARRAY INSTALLATION	Equipment	0.01	0.07	0.07	0.02	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.07**	**0.07**	**0.02**	**0.01**	**0.01**	**0.01**
FENCING	Equipment	0.00	0.02	0.02	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.003**	**0.02**	**0.02**	**0.003**	**0.01**	**0.003**	**0.00**
TOTALS	**Equipment**	**0.24**	**0.27**	**0.70**	**0.05**	**0.03**	**0.02**	**0.03**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.24**	**0.27**	**0.70**	**0.05**	**0.10**	**0.04**	**0.03**
MAX CALENDAR QUARTER	**Equipment**	**0.22**	**0.17**	**0.59**	**0.03**	**0.02**	**0.01**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.22**	**0.17**	**0.59**	**0.03**	**0.08**	**0.03**	**0.02**

Maximum calendar quarter estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

FUGITIVE EMISSIONS DETAILS BY PHASE:

PARAMETER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Assumed Soil Texture Class	sandy loam	sandy loam	sandy loam	sandy loam
Soil PM_{10} Fraction	20.0%	20.0%	20.0%	20.0%
Dust Control Program Effectiveness	50%	50%	50%	0%
Area Disturbed on a Typical Day, acres	0.86	0.09	0.03	0.15
Days of Distrubance	20	48	90	20
Uncontrolled TSP Rate, lbs/acre-day	60.0	40.0	24.0	24.0
Controlled PM_{10} Rate, lbs/acre-day	6.0	4.0	2.4	4.8
Demolition PM_{10}, total pounds	0	0	0	0
Construction Blasting PM_{10}, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
$PM_{2.5}$ fraction of engine exhaust PM_{10}	92.0%	92.0%	92.0%	92.0%
$PM_{2.5}$ fraction of fugitive dust PM_{10}	20.0%	20.0%	20.0%	20.0%
$PM_{2.5}$ fraction of spray paint PM_{10}	91.2%	91.2%	91.2%	91.2%

$PM_{2.5}$ fractions of diesel engine exhaust PM_{10} and spray paint PM_{10} are based on data from the California Air Resources Board CEIDA (California Emission Inventory Data and Reporting System) database, as presented in Appendix A of SCAQMD 2003, Final Methodol to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds.

$PM_{2.5}$ fraction of fugitive dust PM_{10} based on typical clay and fine silt content for soils texture class.

Default $PM_{2.5}$ fractions from CEIDARS database are 92% for diesel engine exhaust, 20.8% for fugitive dust, and 91.2% for spray paint

GLOBAL WARMING POTENTIAL DATA SET SELECTION:

DATA SOURCE	DATA SET CODE	GWP FOR CH_4	GWP FOR N_2O
IPCC 2nd Assessment, 1995:	1	21	310
IPCC 3rd Assessment, 2001:	2	23	296
IPCC 4th Assessment, 2007:	3	25	298

SELECTED GWP DATA SET (1, 2, or 3) =	3	<== Enter code for selected data set.
CH_4 factor:	25	
N_2O factor:	298	

GREENHOUSE GAS EMISSIONS SUMMARY: **2010**

PROJECT PHASE	AVERAGE DAILY GHG EMISSIONS, POUNDS PER DAY			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	831.8	0.04	0.03	**840.2**
FOOTINGS, PADS, BLDG	632.3	0.03	0.02	**639.3**
ARRAY INSTALLATION	250.9	0.01	0.01	**254.1**
FENCING	262.2	0.01	0.01	**265.4**
MAXIMUM DAY:	**831.8**	**0.04**	**0.03**	**840.2**

PROJECT PHASE	TOTAL GHG EMISSIONS, TONS PER YEAR			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREP	8.3	0.0004	0.0003	**8.4**
FOOTINGS, PADS, BLDG	15.2	0.001	0.001	**15.3**
ARRAY INSTALLATION	11.3	0.001	0.0004	**11.4**
FENCING	2.6	0.0001	0.0001	**2.7**
MAXIMUM QUARTER:	**21.6**	**0.001**	**0.001**	**21.8**
CONSTRUCTION PERIOD TOTALS:	**37.4**	**0.002**	**0.001**	**37.8**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame
Maximum day estimates based on expected overlaps among construction phases.

FORMATTED FOOTNOTE SETS:

GWP Data Set 1 footnotes:

CH_4 = methane; GWP multiplier = 21

N_2O = nitrous oxide; GWP multiplier = 310

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 1995 second assessment report, 100 year time frame

GWP Data Set 2 footnotes:

CH_4 = methane; GWP multiplier = 23

N_2O = nitrous oxide; GWP multiplier = 296

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2001 third assessment report, 100 year time frame

GWP Data Set 3 footnotes:

CH_4 = methane; GWP multiplier = 25

N_2O = nitrous oxide; GWP multiplier = 298

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

CALENDAR QUARTER CRITERIA POLLUTANT EMISSIONS: **2010**

CALENDAR QUARTER	COMPONENT	CRITERIA POLLUTANT EMISSIONS, TONS BY CALENDAR QUARTER						
		ROG	NOx	CO	SOx	PM10	PM2.5	DPM
QUARTER 1	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
QUARTER 2	Equipment	0.22	0.17	0.59	0.03	0.02	0.01	0.02
	Fugitive Dust	0.00	0.00	0.00	0.00	0.06	0.01	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.22**	**0.17**	**0.59**	**0.03**	**0.08**	**0.03**	**0.02**
QUARTER 3	Equipment	0.01	0.06	0.08	0.01	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.06**	**0.08**	**0.01**	**0.01**	**0.01**	**0.01**
QUARTER 4	Equipment	0.01	0.04	0.04	0.01	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.04**	**0.04**	**0.01**	**0.01**	**0.01**	**0.00**
MAXIMUM QUARTER	**Equipment**	**0.22**	**0.17**	**0.59**	**0.03**	**0.02**	**0.01**	**0.02**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**	**0.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.22**	**0.17**	**0.59**	**0.03**	**0.08**	**0.03**	**0.02**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM10 = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM10 is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
PM2.5 = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in PM2.5 is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CALENDAR QUARTER GHG EMISSIONS: 2010

CALENDAR QUARTER	GHG EMISSIONS, TONS BY CALENDAR QUARTER			
	CO_2	CH_4	N_2O	GWP, CO_2e
QUARTER 1	0.0	0.000	0.000	**0.0**
QUARTER 2	21.6	0.001	0.001	**21.8**
QUARTER 3	9.2	0.000	0.000	**9.3**
QUARTER 4	6.6	0.000	0.000	**6.7**
MAXIMUM QUARTER	**21.6**	**0.001**	**0.001**	**21.8**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

EQUIPMENT USE DETAILS, PHASE 1: SITE PREP

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	1	2	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	4	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	1	2	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	1	6	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	2	6	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	0	0	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	2	2	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	1	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 2: FOOTINGS, PADS, BLDG

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	1	2	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	1	4	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	2	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	1	1	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	1	1	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	2	1	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	1	1	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	1	1	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 3: ARRAY INSTALLATION

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	1	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	2	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	1	1	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 4: FENCING

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Tracked Loader, 75 - 175 HP	100	57%	75%	0	0	2.97
Small Tracked Shovel Excavator, 75 - 175 HP	100	59%	85%	0	0	3.08
Gas Engine Chippers & Stump Grinders, < 25 HP	15	39%	65%	0	0	0.76
Gasoline Small Chain Saw, < 25 HP	3	50%	65%	0	0	0.19
Small Trencher, < 25 HP	20	64%	85%	0	0	0.74
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	3	1.80
Small Roller/Compactor, 25 - 75 HP	35	59%	85%	0	0	1.20
Small Concrete Pump, 25 - 75 HP	70	62%	75%	0	0	2.52
Gas Engine Concrete Finisher/Vibrator, < 25 HP	8.5	59%	85%	0	0	0.69
Small Rough Terrain Forklift, 25 - 75 HP	70	35%	65%	1	3	1.42
Medium (1,200 gal) Water Truck, 175 - 750 HP	180	57%	65%	0	0	5.35
5-Ton (3.5-5 yd) Dump Truck, 175 - 750 HP	200	57%	25%	0	0	5.95
Standard (4-5 Yard) Cement Mixer Truck	275	57%	40%	0	0	8.18
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	2	8.92
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Emission rates reflect engine HP and load factor; operating time factor is accounted for in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
75.62	596.45	366.39	66.20	50.98	102.34	0.0029	0.0020
48.70	384.15	235.98	42.64	32.83	65.92	0.0028	0.0020
22.99	343.99	236.00	46.09	27.38	68.23	0.0010	0.0007
403.59	11.82	3,504.15	2.16	0.29	14.76	0.0005	0.0004
938.70	8.70	12.75	0.81	0.24	3.60	0.0001	0.0001
13.38	58.81	62.72	9.05	6.14	16.46	0.0002	0.0002
26.57	185.96	131.40	19.90	15.53	39.95	0.0011	0.0008
12.52	140.71	76.41	18.17	11.07	26.55	0.0004	0.0003
28.89	215.45	160.58	30.68	11.63	55.79	0.0008	0.0006
79.09	9.63	1,886.64	1.25	1.10	13.35	0.0002	0.0002
28.02	129.91	121.52	19.14	13.20	31.50	0.0013	0.0009
22.52	233.98	270.86	76.70	28.73	118.65	0.0041	0.0030
25.03	259.97	300.96	85.23	31.92	131.83	0.0110	0.0079
34.41	357.46	413.82	117.19	43.89	181.27	0.0152	0.0108
37.43	388.70	451.44	127.84	47.88	197.75	0.0165	0.0118
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4
2010	MPG	0	MPG	24.1	18.6	18.6	14.3	14.3	10.1	9.4	9.1
2010	VMT	0	VMT	0.3478	0.0899	0.2991	0.0915	0.0421	0.0301	0.001	0.0004
2010	1	1	VOC	0.728	0.762	0.809	1.341	1.399	0.983	0.882	2.498
2010	1	2	CO	9.938	10.966	11.774	15.594	15.787	27.233	29.654	38.885
2010	1	3	NOX	0.598	0.613	0.84	1.111	1.429	1.736	1.768	2.591
2010	1	4	CO2	368.2	477.8	477.8	620.5	620.5	880	947.9	970.5
2010	3	1	Hot Soak	0.127	0.12	0.12	0.215	0.215	0.157	0.122	0.509
2010	4	1	Diurnal	0.026	0.025	0.025	0.044	0.044	0.041	0.034	0.184
2010	5	1	Resting	0.066	0.071	0.071	0.14	0.14	0.105	0.079	0.559
2010	6	1	Running	0.15	0.121	0.121	0.209	0.209	0.178	0.146	0.36
2010	7	1	Crankcase	0.008	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2010	8	1	Refueling	0	0	0	0	0	0	0	0
2010	11	1	Total Evap	0.377	0.346	0.346	0.617	0.617	0.491	0.39	1.622
WORKER VEHICLE MIX				39.96%	10.33%	34.36%	10.51%	4.84%			
			VOC	0.7906112							
			CO	10.856655							
			NOX	1.4713078							
			CO2	425.96515							
TRUKC MIX											
			VOC	0.7655066							
			CO	4.2709759							
			NOX	6.87316							
			CO2	1402.2893							

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B	LDDV	LDDT12	HDDV2B
2010	MPG	0	MPG	8	8.1	7.4	7	0	32.4	24.4	12.9
2010	VMT	0	VMT	0.0011	0.0023	0.001	0	0	0.0003	0	0.0091
2010	1	1	VOC	1.637	1.54	1.746	2.246	0	0.18	2.891	0.329
2010	1	2	CO	36.976	36.047	40.857	45.684	0	0.903	6.729	1.511
2010	1	3	NOX	2.387	2.331	2.659	3.132	0	0.415	2.749	2.502
2010	1	4	CO2	1113.8	1100.6	1200.5	1272.2	0	314.2	417.9	789.1
2010	3	1	Hot Soak	0.32	0.303	0.331	0.452	0	0	0	0
2010	4	1	Diurnal	0.102	0.093	0.103	0.139	0	0	0	0
2010	5	1	Resting	0.278	0.249	0.281	0.399	0	0	0	0
2010	6	1	Running	0.24	0.23	0.247	0.32	0	0	0	0
2010	7	1	Crankcase	0.01	0.01	0.01	0.011	0	0	0	0
2010	8	1	Refueling	0	0	0	0	0	NA	NA	NA
2010	11	1	Total Evap	0.95	0.886	0.972	1.321	0	0	0	0
WORKER VEHICLE MIX											
			VOC								
			CO								
			NOX								
			CO2								
TRUKC MIX											10.95%
			VOC								
			CO								
			NOX								
			CO2								

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B	MC
2010	MPG	0	MPG	11.6	10.2	9.9	8.7	7.5	6.6	6.3	50
2010	VMT	0	VMT	0.0028	0.0028	0.0013	0.0065	0.0094	0.0112	0.04	0.0054
2010	1	1	VOC	0.356	0.479	0.489	0.632	0.79	0.785	0.933	2.757
2010	1	2	CO	1.58	2.28	2.303	2.563	3.219	4.34	5.796	26.134
2010	1	3	NOX	2.62	3.705	3.862	4.882	6.089	7.301	8.873	1.043
2010	1	4	CO2	875.2	1000.9	1032.7	1171.4	1352.5	1550.2	1626.6	177.4
2010	3	1	Hot Soak	0	0	0	0	0	0	0	0.097
2010	4	1	Diurnal	0	0	0	0	0	0	0	0.033
2010	5	1	Resting	0	0	0	0	0	0	0	0.381
2010	6	1	Running	0	0	0	0	0	0	0	0
2010	7	1	Crankcase	0	0	0	0	0	0	0	0
2010	8	1	Refueling	NA	NA	NA	NA	NA	NA	NA	0
2010	11	1	Total Evap	0	0	0	0	0	0	0	0.51
WORKER VEHICLE MIX											
			VOC								
			CO								
			NOX								
			CO2								
TRUKC MIX				3.37%	3.37%	1.56%	7.82%	11.31%	13.48%	48.13%	
			VOC								
			CO								
			NOX								
			CO2								

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	GAS BUS	URB BUS	COM BUS	LDDT34	ALL VEH		Month	Altitude
2010	MPG	0	MPG	6.3	4.3	6.2	17	16.5		7	2
2010	VMT	0	VMT	0.0002	0.001	0.0018	0.0019	1		7	2
2010	1	1	VOC	4	0.59	1.204	0.438	0.866		7	2
2010	1	2	CO	68.316	6.545	5.072	0.818	11.606		7	2
2010	1	3	NOX	5.551	12.883	9.577	0.715	1.351		7	2
2010	1	4	CO2	1405.2	2342.7	1642.6	597.8	553.8		7	2
2010	3	1	Hot Soak	0.513	0	0	0	0.126		7	2
2010	4	1	Diurnal	0.179	0	0	0	0.026		7	2
2010	5	1	Resting	0.55	0	0	0	0.076		7	2
2010	6	1	Running	0.874	0	0	0	0.134		7	2
2010	7	1	Crankcase	0.009	0	0	0	0.009		7	2
2010	8	1	Refueling	0	NA	NA	NA	NA		7	2
2010	11	1	Total Evap	2.123	0	0	0	0.371		7	2
WORKER VEHICLE MIX											
			VOC								
			CO								
			NOX								
			CO2								
TRUKC MIX											
			VOC								
			CO								
			NOX								
			CO2								

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	TMin	Tmax	Nom RVP	Gas Sulfur	Dsl Sulfur	I/M?	Avg Spd	NGV?
2010	MPG	0	MPG	45	75	9	30	0	No	27.6	No
2010	VMT	0	VMT	45	75	9	30	0	No	27.6	No
2010	1	1	VOC	45	75	9	30	0	No	27.6	No
2010	1	2	CO	45	75	9	30	0	No	27.6	No
2010	1	3	NOX	45	75	9	30	0	No	27.6	No
2010	1	4	CO2	45	75	9	30	0	No	27.6	No
2010	3	1	Hot Soak	45	75	9	30	0	No	27.6	No
2010	4	1	Diurnal	45	75	9	30	0	No	27.6	No
2010	5	1	Resting	45	75	9	30	0	No	27.6	No
2010	6	1	Running	45	75	9	30	0	No	27.6	No
2010	7	1	Crankcase	45	75	9	30	0	No	27.6	No
2010	8	1	Refueling	45	75	9	30	0	No	27.6	No
2010	11	1	Total Evap	45	75	9	30	0	No	27.6	No
WORKER VEHICLE MIX											
			VOC								
			CO								
			NOX								
			CO2								
TRUKC MIX											
			VOC								
			CO								
			NOX								
			CO2								

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	E200	E300	Arom	Olef	Benz	MTBE vol%	TBE MktF	ETBE vol%
2010	MPG	0	MPG	0	0	0	0	0	0	0	0
2010	VMT	0	VMT	0	0	0	0	0	0	0	0
2010	1	1	VOC	0	0	0	0	0	0	0	0
2010	1	2	CO	0	0	0	0	0	0	0	0
2010	1	3	NOX	0	0	0	0	0	0	0	0
2010	1	4	CO2	0	0	0	0	0	0	0	0
2010	3	1	Hot Soak	0	0	0	0	0	0	0	0
2010	4	1	Diurnal	0	0	0	0	0	0	0	0
2010	5	1	Resting	0	0	0	0	0	0	0	0
2010	6	1	Running	0	0	0	0	0	0	0	0
2010	7	1	Crankcase	0	0	0	0	0	0	0	0
2010	8	1	Refueling	0	0	0	0	0	0	0	0
2010	11	1	Total Evap	0	0	0	0	0	0	0	0
WORKER VEHICLE MIX											
			VOC								
			CO								
			NOX								
			CO2								
TRUKC MIX											
			VOC								
			CO								
			NOX								
			CO2								

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	TBE MktFr	ETOH vol%	TOH MktFr	TAME vol%	AME MktFr	Part Size
2010	MPG	0	MPG	0	0	0	0	0	0
2010	VMT	0	VMT	0	0	0	0	0	0
2010	1	1	VOC	0	0	0	0	0	0
2010	1	2	CO	0	0	0	0	0	0
2010	1	3	NOX	0	0	0	0	0	0
2010	1	4	CO2	0	0	0	0	0	0
2010	3	1	Hot Soak	0	0	0	0	0	0
2010	4	1	Diurnal	0	0	0	0	0	0
2010	5	1	Resting	0	0	0	0	0	0
2010	6	1	Running	0	0	0	0	0	0
2010	7	1	Crankcase	0	0	0	0	0	0
2010	8	1	Refueling	0	0	0	0	0	0
2010	11	1	Total Evap	0	0	0	0	0	0
WORKER VEHICLE MIX									
			VOC						
			CO						
			NOX						
			CO2						
TRUKC MIX									
			VOC						
			CO						
			NOX						
			CO2						

MOB6-EMISSION RATES 2010

CY	EType	Pol #	Pol Name	Description					
2010	MPG	0	MPG	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	VMT	0	VMT	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	1	1	VOC	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	1	2	CO	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	1	3	NOX	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	1	4	CO2	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	3	1	Hot Soak	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	4	1	Diurnal	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	5	1	Resting	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	6	1	Running	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	7	1	Crankcase	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	8	1	Refueling	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
2010	11	1	Total Evap	CHEYENNE MOUNTAIN AFS CONSTRUCTION VEHICLES					
WORKER VEHICLE MIX									
			VOC						
			CO						
			NOX						
			CO2						
TRUKC MIX									
			VOC						
			CO						
			NOX						
			CO2						

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RECORD OF NONAPPLICABILITY FOR CHEYENNE MOUNTAIN AIR FORCE STATION SOLAR ARRAY

The U.S. Air Force proposes to install a 1-megawatt photovoltaic solar array at Cheyenne Mountain Air Force Station southwest of Colorado Springs, CO. Three alternative sites on the Station have been identified that can accommodate the initial 1-megawatt array and a possible future expansion for the array. The proposed action would assist the Air Force in meeting the renewable energy goals set by the Energy Policy Act of 2005 and Executive Order 13423.

All three alternative sites are in areas designated as maintenance for carbon monoxide. Consequently, the proposed action has been evaluated for compliance with Section 176(c) of the Clean Air Act (42 USC 7506) and with the U.S. Environmental Protection Agency (U.S. EPA) rule promulgated at 40 CFR Part 93.

The Environmental Assessment (EA) prepared for the solar array project estimates the quantities of direct and indirect emissions resulting from its construction and operation. In each case, total direct and indirect emissions would be less than the relevant Clean Air Act conformity *de minimis* level for carbon monoxide (100 tons per year). Pursuant to 40 CFR 93.153(c)(1), I find that the requirements of the U.S. EPA general conformity rule are not applicable to the proposed Air Force action.

Signature: Jason J. Cook

Date: 1/22/10

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APPENDIX B – ENERGY DATA

Appendix B
Potential Megawatts Based on Available Sunshine at Colorado Springs

Month	Days	Length of Day Month Low[3]	Length of Day Month High[3]	Average Available Sunlight (hours/minutes)	Monthly Total Megawatts Possible (days X average available sunlight)	Percent sunshine[2]	Megawatts	Convert minutes to percent[1]	Average available sunlight
January	31	9:30	10:14	9:52	305.87	0.7	214.11	0.866666667	9.866666667
February	28	10:16	11:18	10:17	287.93	0.7	201.55	0.283333333	10.28333333
March	31	11:21	12:37	11:59	371.48	0.7	260.04	0.983333333	11.98333333
April	30	12:39	13:48	13:14	397.00	0.7	277.90	0.233333333	13.23333333
May	31	13:50	14:41	14:16	442.27	0.7	309.59	0.266666667	14.26666667
June	30	14:43	14:53	14:48	444.00	0.7	310.80	0.8	14.8
July	31	14:11	14:50	14:31	450.02	0.7	315.01	0.516666667	14.51666667
August	31	13:03	14:09	13:36	421.60	0.7	295.12	0.6	13.6
Spetmeber	30	11:49	13:01	12:25	372.50	0.7	260.75	0.416666667	12.41666667
October	31	10:34	11:46	11:10	346.17	0.7	242.32	0.166666667	11.16666667
November	30	9:40	10:31	10:06	303.00	0.7	212.10	0.1	10.1
December	31	9:27	9:39	9:33	296.05	0.7	207.24	0.55	9.55
Total	**365**				**4,437.88**		**3,106.52**		

Notes:

1 - Convert minutes from percent minutes/60 (i.e. 52/60 = 0.866667)

2 - National Oceanic Atmospheric Administration data shows that average cloud cover is 30 percent over the typical month; consequently the percent of sunshine was calculated at 70 percent.

3 - Source: timeand date.com 2009

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YEARLY ENERGY DATA

	Category	Unit	2003	2005	% Change	2006	% Change	2007	% Change
Electric Consumption	WAPA	mWh	5690	5569	-2.13%	5505	-3.25%	5510	-3.16%
	CSU	mWh	24976	25778	3.21%	27051	8.31%	27096	8.49%
	Total	mWh	30666	31347	2.22%	32556	6.16%	32606	6.33%
Electric Cost	WAPA	$K	$105	$106	0.95%	$112	6.67%	$118	12.38%
	CSU	$K	$1,080	$1,296	20.00%	$1,423	31.76%	$1,548	43.33%
	Total	$K	$1,185	$1,402	18.31%	$1,535	29.54%	$1,666	40.59%
	Rate	$/kWh	$0.0386	0.0447	15.74%	0.0471	22.02%	0.0511	32.23%
Energy Intensity	Consumption	MMBTU	104632	106,956	2.22%	111080	6.16%	111251	6.33%
	Intensity	MMBTU/SF	0.2567	0.2624	2.22%	0.2726	6.16%	0.2730	6.33%
	Intensity	kWh/SF	75.25	76.92	2.22%	79.89	6.16%	80.01	6.33%
	Intensity	$/SF	$2.91	$3	18.31%	$3.77	29.54%	$4.09	40.59%

Source: CMAFS Energy Manager 2009

Knight, Jim

From:	Ray, Dwayne E Ctr USAF AFSPC 721 MSG/CEAN-PWT [dwayne.ray.ctr@cheyennemountain.af.mil]
Sent:	Tuesday, December 22, 2009 1:42 PM
To:	Knight, Jim
Subject:	EA, CMAFS

Here's the 2008 and 2009 data to add to the EA

Source	Units	2008	2009
WAPA	MWh	5510	5495
CSU	"	27224	27631
Total	"	32734	33126
Monhly	"	2728	2761

Dwayne Ray, REM
Environmental Coordinator
721 MSG/CEAN-PWT
Cheyenne Mountain AFS CO
719 474 3620

APPENDIX C – DISTRIBUTION LIST

DISTRIBUTION LIST

Mr. Dewey Tsonetokoy
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Kiowa Nation of Oklahoma
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Carnegie, OK 73015

Mr. Terry Knight, Sr.
NAGPRA Representative
Ute Mountain Ute Tribe
P.O. Box 53
Towaoc, CO 81334

Bryan F. Vigil
Heritage Specialist
Jicarilla Apace Nation
P.O. Box 1367
Dulce, NM 87528

Mr. Ernest House, Jr., Executive Secretary
Colorado Commission of Indian Affairs
130 State Capitol
Denver, CO 80203-1792

Office of Archaeology and Historic Preservation
225 E. 16th Ave., Suite 950
Denver CO 80203

Colorado Springs Planning Office
30 S. Nevada Avenue, Suite 301
Colorado Springs, CO 80903

Colorado Division of Wildlife
Southeast Region Service Center
4255 Sinton Road
Colorado Springs, CO 80907

Mr. Les Gruen
District IX
Colorado Department of Transportation
4201 E Arkansas Ave
Denver CO 80222

Bureau of Land Management
Front Range Field Office
3028 East Main Street
Cañon City, Colorado 81212

U.S. Forest Service
Rocky Mountain Region
740 Simms St
Golden, CO 80401

Bob Jorgenson
Colorado Department of Public Health and
Environment - Air Pollution Control
Division (APCD-SS-B1)
4300 Cherry Creek Dr. South
Denver, CO 80246-1530

Nathan Moore
Colorado Department of Public Health and
Environment - Water Quality Control
Division (WQCD-P-B2)
4300 Cherry Creek Drive South
Denver, CO 80246

Jeffery Burwell
U.S. Department of Agriculture
Natural Resource Conservation Service
655 Parfet St.
Lakewood, CO 80215

Susan Linner
Colorado Field Supervisor
U.S. Fish & Wildlife Service
134 Union Blvd, Suite 670
Lakewood, CO 80228

Diana Huber
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Environment – Hazardous Materials Division
4300 Cherry Creek Drive South
Denver, CO 80246

Ron Cattany
Colorado Division of Natural Resources
Division of Minerals & Geology
1313 Sherman Street, Room 215
Denver, CO 80203

Colorado Division of Natural Resources
Colorado Geological Survey
1313 Sherman Street, Room 715
Denver, CO 80203

Shaun Deeney
Area Wildlife Manager
Colorado Division of Wildlife
4255 Sinton Road
Colorado Springs, CO 80907

Heather Peterson
Colorado Historical Society
1300 Broadway
Denver, CO 80203

Craig Blewitt
City of Colorado Springs
Transportation Planning Department.
30 South Nevada Ave, Suite 405
Colorado Springs, CO 80903

Dick Anderwald
City of Colorado Springs
Planning Department
30 South Nevada Ave, Suite 301
Colorado Springs, CO 80903

City of Colorado Springs
Stormwater Department
PO Box 1575, MC 435
Colorado Springs, CO 80901

Rita Soller
Colorado Springs Utilities
845 E. Las Vegas St.
Colorado Springs, CO 80903

Mike Hrebenar
El Paso County
Planning Department
27 E. Vermijo Ave
Colorado Springs, CO 80903

Pikes Peak Area Council of Governments
15 South 7th Street
Colorado Springs, CO 80905

Larry Svoboda, NEPA Program Chief
EPA Region 8 (8EPR-N)
1595 Wynkoop Street
Denver, CO 80202-1129

U.S. Senator Michael Bennet
Pikes Peak Office
409 North Tejon St., Suite 107
Colorado Springs, 80903

U.S. Senator Mike Udall
Colorado Springs Office
2880 Intl Cir, Suite 107
Colorado Springs, CO 80910

U.S. Congressman Doug Lamborn
District Office
1271 Kelly Johnson Blvd. Suite 110
Colorado Springs, CO 80920

Keith King
Colorado State Senator, District 12
Office Location: 200 E. Colfax
Denver, CO 80203

Bill Cadman
Colorado State Senator, District 10
Office Location: 200 E. Colfax
Denver, CO 80203

Bob Gardner
Colorado State Representative, District 21
Office Location: 200 E. Colfax
Denver, CO 80203

Tom Massey
Colorado State Representative, District 60
Office Location: 200 E. Colfax
Denver, CO 80203

Penrose Public Library
Pikes Peak District
20 North Cascade Ave
Colorado Springs, CO 80903

APPENDIX D – AF 813 AND AF 332

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS			Report Control Symbol RCS.
INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*			
SECTION I - PROPONENT INFORMATION			
1. TO *(Environmental Planning Function)* 721 MSG/CEAN-PWT	2. FROM *(Proponent organization and functional address symbol)* 721 MSG/CEO		2a. TELEPHONE NO. 4743620
3. TITLE OF PROPOSED ACTION Solar Farm at Cheyenne Mountain AFS			
4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)* Environmental Assessment with supporting FONSI statement			
5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES (DOPAA) *(Provide sufficient details for evaluation of the total action.)* Construstion of 1 MW solar array			
6. PROPONENT APPROVAL *(Name and Grade)* Dwayne Ray	6a. SIGNATURE Dwayne Ray		6b. DATE 20090114

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects Including cumulative effects.) (+ = positive effect; 0 = no effect; − = adverse effect; U= unknown effect)*	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*		✓		
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)*		✓		
9. WATER RESOURCES *(Quality, quantity, source, etc.)*		✓		
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*				✓
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*		✓		
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*		✓		
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*		✓		
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*				✓
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*	✓			
16. OTHER *(Potential impacts not addressed above.)* POSSIBLE VISUAL IMPACT			✓	

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # ________ ; OR
✓ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS
Contacted AFSPC NEPA coordinator; she confirmed that no CATEX could be applied to this project.

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)*	19a SIGNATURE	19b. DATE
Jason Cook, Chief, Operations Branch	Jason J. Cook	20090114

BASE CIVIL ENGINEER WORK REQUEST
(See Reverse for Instructions)

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average .3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to the Department of Defense, Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. and to the Office of Management and Budget, Paperwork Reduction Project 0704-0188, Washington DC 20503. Please DO NOT RETURN your form to either of these addresses. Send your completed form to HQ AFESC/DEMG.

SECTION I - TO BE COMPLETED BY REQUESTER

1. FROM *(Organization)*	2. OFFICE SYMBOL	3. DATE OF REQUEST	4. WORK REQUEST NO. *(For BCE Use)*
721 MSG/CEAO	AFSS	20090305	22854

5. NAME AND PHONE NO. OF REQUESTER	6. REQUIRED COMPLETION DATE	7. BUILDING, FACILITY OR STREET ADDRESS WHERE WORK IS TO BE ACCOMPLISHED
Diane Selleny, 474-3228		primary site: west of 300 area

8. DESCRIPTION OF WORK TO BE ACCOMPLISHED *(Include Sketch or Plan, when appropriate)*

Install 1MW solar PV array at CMAFS. Estimated cost: $7,930,802 (cost estimate attached). 1MW solar array will generate approximately 1,400 MWh to 1,700 MWh per year, which equals approximately 5% of CMAFS consumption. Three potential solar sites approved by the FUB, primary siting choice west of 300 area (map attached).

9. BRIEF JUSTIFICATION FOR WORK TO BE ACCOMPLISHED *(Not required for maintenance and repair)*

Energy Independence and Security Act of 2007 requires that 25% of energy consumed must come from renewable sources by the year 2025; Energy Policy Act of 2005 requires that 3% of energy consumed in FY2007-FY2009, 5% of energy consumed in FY2010-FY2012 and 7.5% of energy consumed in FY2013 and thereafter come from renewable sources; and EO 13423 requires that at least half of the EPACT required renewable energy consumed must come from new renewable sources.

10. DONATED RESOURCES

FUNDS	LABOR	MATERIAL	CONTRACT BY REQUESTER	NONE

11. NAME OF REQUESTER	12. GRADE OF REQUESTER	13. SIGNATURE OF REQUESTER *(See Reverse of Form)*
Diane Selleny	Contractor	Diane Selleny

14. COORDINATION

BJ 3/9/09 721 MSG/CEAN-PWT — 721MSG-CEAO DS 3/9/09 — 721 MSG/JTO 3/10/09 JP — 721MSG/CEF [illegible] 11 MAR 09 — TC 11/3/9 21 AMDS/SGPB

SECTION II - FOR BASE CIVIL ENGINEER USE

15. WORK ORDER *(Place an "X" in the appropriate box.)*

IN-SERVICE	SELF-HELP	CONTRACT	SABER

16. DIRECT SCHEDULED WORK *(Place an "X" in the appropriate box.)*

EMERGENCY	URGENT	ROUTINE	SELF-HELP	M/C

17. SELF-HELP *(Place an "X" in the appropriate box.)*

BRIEFING REQUIRED	ADEQUATE COORDINATION	INSPECTION REQUIRED

SECTION III - COMPLETE ONLY IF WORK IS TO BE ACCOMPLISHED BY WORK ORDER

18. WORK CLASS	19. PRIORITY	20. ESTIMATED HOURS	21. ESTIMATED FUNDED COST	22. ESTIMATED TOTAL COST
				$7930802.00

23. THERE IS NO NEED FOR AN ENVIRONMENTAL ASSESSMENT (AFR 19-2)	X 24. A WRITTEN ASSESSMENT IS BEING/HAS BEEN PROCESSED	X 25. APPROVED	26. DISAPPROVED

27. REMARKS

813 REQUIRED

[signature] 3/16/09

SECTION IV - APPROVING AUTHORITY

28. NAME AND GRADE *(Please Type or Print)*	29. SIGNATURE	30. DATE
JASON J. COOK, YF-2	Jason J. Cook	12 MAR 09

AF IMT 332, 19910101, V4 — PREVIOUS EDITION IS OBSOLETE. — MASTER FILE COPY

APPENDIX E – COMMENTS/RESPONSE TO COMMENTS

#	Section/page/line/Fig	Commenter	Comment
			Comments on DEA for 1-MW Solar Array for CMAFS **Dated 1 April 2010**
			Suggested Response
1	General	John Schullek (Email response)	A 1 MW solar array spanning 10 acres on the side of Cheyenne Mountain, right in my backyard. Are you kidding there is a finding of 'no significant impact'??? Who are you fricking kidding??? I've worked all my life to deserve my current home which just so happens to be near NORAD. If it's not Ft. Carson shelling at night; it's you guys now tearing up the mountainside. My vote is close the facility!!! It has wasted the taxpayer's dollars for decades running. There seems to never be an end to the amount of waste the military can dream up. The military spending in this country has bankrupted the country!!! I have been saving for years to put solar panels on my roof and now more of my tax dollars go to improving your facility. That's bullshit!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! You have my vote to close the out-dated place. Or better yet, move it to Nevada where solar power should be cultivated. Quit wasting the taxpayer's dollars!!!!(A copy of the email is provided in Appendix E)
Noted.			
2	Geology and Soils	TC Wait Colorado Geological Survey (Email response)	In response to your request, the CGS has reviewed the location of the proposed 1-megawatt solar array at Cheyenne Mountain AFS and would like to submit comments regarding geologic hazards that may affect the proposed array location. According to the notice, three proposed site locations were evaluated and found to have no significant environmental impact. However, a detailed geologic investigation was not included for review by CGS and geologic hazards were not addressed in the environmental summary. CGS has been involved with extensive mapping and geologic hazard assessment efforts in the Colorado Springs area, and would like to provide comments regarding geologic conditions at the proposed locations for the solar array for your consideration during the planning process.

Comments on DEA for 1-MW Solar Array for CMAFS Dated 1 April 2010			
#	Section/page/line/Fig	Commenter	Comment
			Suggested Response
			The proposed site (Site 1) is located directly west of the parking area and east of the Cheyenne Mountain portal. • Site 1 is largely located on a geologically young debris fan formed from debris flow runoff from Cheyenne Mountain. These debris channels are known to be recently active, with significant debris flow damage occurring in the mid 1960s. Currently the parking area and access road, although not designed with this intent, are serving as a make-shift debris flow catchment for the residential properties to the east. • Likely there are large boulders in the subsurface that may make excavation difficult. • This site sits about 0.1 miles east from the Ute Pass Fault zone, which is known to have moved during geologically recent times. • This site may be impacted by rockfall/roll stemming from the steep slopes and outcrops on Cheyenne Mountain. • Site 1 is located on mapped landslide material. The slopes on the east face of Cheyenne Mountain are believed to be largely composed of landslide materials from catastrophic mass movements related to glacial melting. While some of the slide mass has somewhat stabilized over time, some areas have experienced ongoing instability. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated. Alternative A (Site 2) is located north of the final switch back before the parking area, and directly south of a residential area. • Site 2 is also partially located on a young debris flow fan. Site 2 is somewhat

Comments on DEA for 1-MW Solar Array for CMAFS Dated 1 April 2010			
#	Section/page/line/Fig	Commenter	Comment Suggested Response
			protected from future debris flow impacts by the parking area and access road, which are acting as a make-shift catchment structure. • Likely there are large boulders in the subsurface that may make excavation difficult.
			• This site sits about 0.5 miles east of the Ute Pass Fault zone, which is known to have moved during geologically recent times. • This site is less likely to be impacted by rockfall/roll, which would also likely be slowed by the parking area and access road before reaching the site. • Site 2 is located on mapped landslide material. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated. Alternative B (Site 3) is located south of the portal area along the Limekiln Valley drainage. • Site 3 is located alongside an existing drainage channel which may carry water following precipitation, and could potentially carry debris flow material from the steep slopes to the west. • There may be large boulders in the subsurface that could make excavation difficult. • This site also sits directly on several faults, including a splay of the Ute Pass Fault zone, which is known to have moved during geologically recent times. • This site may be impacted by rockfall/roll stemming from the steep slopes and

<table>
<tr><th colspan="4">Comments on DEA for 1-MW Solar Array for CMAFS
Dated 1 April 2010</th></tr>
<tr><th>#</th><th>Section/page/line/Fig</th><th>Commenter</th><th>Comment</th></tr>
<tr><th colspan="4">Suggested Response</th></tr>
<tr><td></td><td></td><td></td><td>outcrops on Cheyenne Mountain.

• Site 3 is partially located on mapped landslide material. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated. The presence of the shear zone from the fault may decrease slope stability due to fractured rock and the ability to carry water in the fractures.

• This site is located on steeper terrain, which would lead to greater problems with slope creep and erosion.

CGS feels that a geologic evaluation for all three possible sites would be warranted to determine specific hazards and propose mitigation measures to protect the solar array and also adjacent property.

(a Copy of Mr. Wait comments are provided in Appendix E)</td></tr>
<tr><td colspan="4">Noted with the following response. A Seismic Survey has been conducted at Cheyenne Mountain Air Station as part of a FEMA 178 Review in April 1978. In the summary of that report four potential earthquake-related hazards were assessed for the site; strong ground shaking, ground surface rupture, soil liquefaction, and slope failure. The report further stated that the facility is located in a low seismic active region of the United States. FEMA-178 indicates that the site coefficients for the seismicity are Aa=0.05 and Av=0.05. Similarly, the site falls within Seismic Zone 1 (Scale of 0 to 4) of the Uniform Building Code, where 4 is a high risk and 0 is no risk. Potential for soil amplification, liquefaction, and surface rupture are considered minimal for the site. For buildings located near the north entry, a moderate potential exists for rockfall from the granite outcroppings located above the site. We recognize and concur with CGS's comments regarding the need to identify and evaluate the potential geophysical hazards that exist at each proposed site. These evaluations will be conducted during the design-level geotechnical/geological investigation phase of the project as part of a geologic hazard evaluation. Additional information has been added to the EA concerning geologic hazards and potential impacts of seismic events.</td></tr>
</table>

Comments on DEA for 1-MW Solar Array for CMAFS Dated 1 April 2010			
#	Section/page/line/Fig	Commenter	Comment
Suggested Response			
3	General	Alexander Daube (Email response)	Regarding the proposed installation of the 1 Megawatt Solar Array on Cheyenne Mountain, Great idea! Do it! Hey, do you still give public tours? Let me know.
Noted. Thank you for your response.			

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Knight, Jim

From:	Ray, Dwayne E Ctr USAF AFSPC 721 MSG/CEAN-PWT [dwayne.ray.ctr@cheyennemountain.af.mil]
Sent:	Wednesday, February 24, 2010 8:42 AM
To:	Knight, Jim
Subject:	FW: Response to 1 MW solar array

????????????????????????

Dwayne Ray, REM
Environmental Coordinator
721 MSG/CEAN-PWT
Cheyenne Mountain AFS CO
719 474 3620

-----Original Message-----
From: John Schullek [mailto:jschullek@yahoo.com]
Sent: Tuesday, February 23, 2010 6:53 PM
To: Ray, Dwayne E Ctr USAF AFSPC 721 MSG/CEAN-PWT
Subject: Response to 1 MW solar array

Dwayne:
A 1 MW solar array spanning 10 acres on yhe side of Cheyenne Mountain, right in my backyard. Are you kidding there is a finding of 'no significant impact'??? Who are you fricking kidding???
I've worked all my life to deserve my current home which just so happens to be near NORAD.
If it's not Ft. Carson shelling at night; it's you guys now tearing up the mountainside.
My vote is close the facility!!!
It has wasted the taxpayer's dollars for decades running. There seems to never be an end to the amount of waste the military can dream up.
The military spending in this country has bankrupted the country!!!
I have been saving for years to put solar panels on my roof and now more of my taxdollars go to improving your facility. That's bullshit!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
You have my vote to close the out-dated place. Or better yet, move it to Nevada where solar power should be cultivated.
Quit wasting the taxpayer's dollars!!!!

STATE OF COLORADO

COLORADO GEOLOGICAL SURVEY— *serving the people of Colorado*

Department of Natural Resources
1313 Sherman Street, Room 715
Denver, CO 80203
Phone: (303) 866-2611
Fax: (303) 866-2461

COLORADO
DEPARTMENT OF NATURAL RESOURCES

Bill Ritter, Jr.
Governor

James B. Martin
Executive Director

Vincent Matthews
Division Director and
State Geologist

February 22, 2010

Legal: **S ½ of S13, T15S, R67W**

Mr. Dwayne Ray, REM
Environmental Coordinator
721 MSG/CEAN-PWT
Cheyenne Mountain AFS CO 80914

Re: **Solar Array at Cheyenne Mountain AFS**
CGS Review No. EP-10-0014

Dear Mr. Ray;

In response to your request, the CGS has reviewed the location of the proposed 1-megawatt solar array at Cheyenne Mountain AFS and would like to submit comments regarding geologic hazards that may affect the proposed array location. According to the notice, three proposed site locations were evaluated and found to have no significant environmental impact. However, a detailed geologic investigation was not included for review by CGS and geologic hazards were not addressed in the environmental summary.

CGS has been involved with extensive mapping and geologic hazard assessment efforts in the Colorado Springs area, and would like to provide comments regarding geologic conditions at the proposed locations for the solar array for your consideration during the planning process.

The proposed site (Site 1) is located directly west of the parking area and east of the Cheyenne Mountain portal.

- Site 1 is largely located on a geologically young debris fan formed from debris flow runoff from Cheyenne Mountain. These debris channels are known to be recently active, with significant debris flow damage occurring in the mid 1960s. Currently the parking area and access road, although not designed with this intent, are serving as a make-shift debris flow catchment for the residential properties to the east.
- Likely there are large boulders in the subsurface that may make excavation difficult.
- This site sits about 0.1 miles east from the Ute Pass Fault zone, which is known to have moved during geologically recent times.
- This site may be impacted by rockfall/roll stemming from the steep slopes and outcrops on Cheyenne Mountain.
- Site 1 is located on mapped landslide material. The slopes on the east face of Cheyenne Mountain are believed to be largely composed of landslide materials from catastrophic

mass movements related to glacial melting. While some of the slide mass has somewhat stabilized over time, some areas have experienced ongoing instability. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated.

Alternative A (Site 2) is located north of the final switch back before the parking area, and directly south of a residential area.

- Site 2 is also partially located on a young debris flow fan. Site 2 is somewhat protected from future debris flow impacts by the parking area and access road, which are acting as a make-shift catchment structure.
- Likely there are large boulders in the subsurface that may make excavation difficult.
- This site sits about 0.5 miles east of the Ute Pass Fault zone, which is known to have moved during geologically recent times.
- This site is less likely to be impacted by rockfall/roll, which would also likely be slowed by the parking area and access road before reaching the site.
- Site 2 is located on mapped landslide material. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated.

Alternative B (Site 3) is located south of the portal area along the Limekiln Valley drainage.

- Site 3 is located alongside an existing drainage channel which may carry water following precipitation, and could potentially carry debris flow material from the steep slopes to the west.
- There may be large boulders in the subsurface that could make excavation difficult.
- This site also sits directly on several faults, including a splay of the Ute Pass Fault zone, which is known to have moved during geologically recent times.
- This site may be impacted by rockfall/roll stemming from the steep slopes and outcrops on Cheyenne Mountain.
- Site 3 is partially located on mapped landslide material. Detailed stability analysis and global impacts of development for adjacent properties should be evaluated. The presence of the shear zone from the fault may decrease slope stability due to fractured rock and the ability to carry water in the fractures.
- This site is located on steeper terrain, which would lead to greater problems with slope creep and erosion.

CGS feels that a geologic evaluation for all three possible sites would be warranted to determine specific hazards and propose mitigation measures to protect the solar array and also adjacent property. If you have further questions about this site, please contact me at (303) 866-2611.

Sincerely,

TC Wait
Engineering Geologist

Cc: file

Knight, Jim

From: Ray, Dwayne E Ctr USAF AFSPC 721 MSG/CEAN-PWT [dwayne.ray.ctr@cheyennemountain.af.mil]
Sent: Wednesday, February 24, 2010 9:11 AM
To: Knight, Jim
Subject: FW: Public comments: Cheyenne Mountain - 1 Megawatt Solar Array

Dwayne Ray, REM
Environmental Coordinator
721 MSG/CEAN-PWT
Cheyenne Mountain AFS CO
719 474 3620

-----Original Message-----
From: booboo894@juno.com [mailto:booboo894@juno.com]
Sent: Saturday, February 20, 2010 2:54 PM
To: Ray, Dwayne E Ctr USAF AFSPC 721 MSG/CEAN-PWT
Cc: booboo894@juno.com
Subject: Public comments: Cheyenne Mountain - 1 Megawatt Solar Array

Regarding the proposed installation of the 1 Megawatt Solar Array on Cheyenne Mountain,

Great idea!

Do it!

Hey, do you still give public tours? Let me know.

Alexander Daube